Natural Thinking

A Report by Dr William Bird,

for the Royal Society for the Protection of Birds,

Investigating the links between the Natural Environment, Biodiversity and Mental Health

1st Edition

June 2007

About the Author:

Dr William Bird is Strategic Health Advisor to Natural England and a GP in Reading.

He independently chairs the Outdoor Health Forum which has a wide membership to promote the use of the outdoors for health. He set up the first Health Walk scheme and Green Gym in the mid 1990s and brought the Countryside Agency and British Heart Foundation together, resulting in Walking the Way to Health. He was the medical adviser to The British Heart Foundation National Centre for Physical Activity and Health at Loughborough University when it was first established.

He was an independent member of the National Access Forum, which advised the Countryside Agency and Government on the Countryside and Rights of Way Bill. He is a vice president of British Trust for Conservation Volunteers.

He has held Honorary Research Posts at Oxford Brookes and Oxford University, and between 1999 and 2006 he set up the Health Forecasting Unit at the Met Office where he was Clinical Director.

The Royal Society for the Protection of Birds

The RSPB is Europe's largest wildlife charity with over one million members. It manages one of the largest conservation estates in the UK with more than 200 nature reserves, covering more than 100,000 hectares. RSPB nature reserves provide a major recreational resource for people, as well as conserving biodiversity: over 1.5 million visits are made to RSPB reserves each year. Its reserve volunteering programme benefits the health of participants, as well as assisting land management for biodiversity. The RSPB advocates creation of more opportunities for people to enjoy the countryside in ways that do not harm the very resources people wish to enjoy, including wildlife.

Further copies of this report can be downloaded from www.rspb.org.uk/policy/health

Natural England

Natural England works for people, places and nature to conserve and enhance biodiversity, landscapes and wildlife in rural, urban, coastal and marine areas. Based on the evidence in this report, and its sister publication "Natural Fit", Natural England supports the view that contact with natural green space benefits peoples' health. It encourages all those with an interest in health and wellbeing to consider the role of the natural environment in managing public health. www.naturalengland.org.uk

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Introduction

The Value of the Natural Environment

This report, commissioned by the RSPB, looks at the evidence linking wildlife-rich areas and green space with mental health. Past generations have intuitively understood this relationship, perhaps better than we do, yet the evidence needed to quantify the health value of the natural environment is still evolving.

It is a paradox that as a society we find it unacceptable to take wild animals to be kept in captivity, yet older people in residential care homes can stay indoors for years with no access to the stimulation of the outside world. We spend millions to create ideal conditions for our garden plants balancing the right soil with the correct amount of shade and the right moisture, yet we allow our children to grow up in a hostile urban wilderness with concrete walkways, heavy traffic and no contact with nature.

Logic would suggest that after 10,000 generations having to survive in a natural environment, human evolution would have programmed our genes to perform best in a favoured natural environment of water, shelter, food and safety. By the same logic, it would be surprising if the rapid disconnection of humans from nature in just a few generations did not cause some difficulty to adapt to this new environment. EO Wilson, who proposes the Biophilia hypothesis, says that '*beauty is in the eye of the gene*'; a deep genetic sequence may be hard to erase despite our efforts to be technically independent from nature and the natural environment.

Humans are a species with as much need for the natural environment as any other. However, we are also a social species that thrives in towns and cities and has prospered with the use of technology. But neither technology nor cities can replace our need for the natural environment. We have to keep a balance. By disconnecting from our natural environment, we have become strangers to the natural world: our own world. This has challenged our sense of identity and in some more subtle ways has had a significant affect on our mental health.

This report is one step to bring together the evidence in this area of mental health. It is a start, but much more rigorous data is required if we are to quantify the strength of this effect and measure which aspects of mental health are benefited. It suggests that contact with the natural environment may offer considerable mental health benefits and have a positive effect on communities. In essence, this means that the natural environment has a quantifiable health value.

With a dearth of solutions for major problems such as obesity, inactivity, stress and antisocial behaviour, which governments are struggling to solve, the value of the natural environment needs to be understood, quantified and then acted upon. To ignore these findings may result in further loss of natural green space that will never be recovered and so deprive future generations of a "natural health service".

Dr William Bird, June 2007

1. Summary

This report presents evidence that suggests a positive effect from contact with nature and green space on our mental health. There are three main hypotheses that try to explain this positive effect.

Overall, there is a significant quantity of work that is mutually supportive and suggests, as a minimum, that contact with many aspects of nature benefits mental health, sometimes in quite dramatic and unexpected ways.

The evidence is sufficient to suggest that a major trend may be at work. It is time for these findings to be acted upon by research funders, policy makers and public health professionals, and be more thoroughly researched, because the health benefits identified by existing work could have enormous implications – contact with nature may be an effective component of:

- Treatment for children with poor self-discipline, hyperactivity and Attention Deficit Hyperactivity Disorder (ADHD).
- Coping with anxiety and stress, particularly for patients undergoing operations or cancer treatment.
- Strategies to reduce crime and aggression
- Benefiting elderly care and treatment for dementia.
- Concentration levels in children and office workers.
- Stress
- Healthy cognitive development of children.
- Improving hospital environments
- Strengthened Communities
- Increased sense of wellbeing and mental health

What is Mental Health?

Mental health and wellbeing are not just the absence of disease but a state in which a person is most fulfilled can make sense of their surroundings, feel in control, can cope with every day demands and has purpose in life. The WHO European declaration of mental health[1] states:

"There is no health without mental health. Mental health is central to the human, social and economic capital of nations and should therefore be considered as an integral and essential part of other public policy areas such as human rights, social care, education and employment."

"Mental health and mental wellbeing are fundamental to the quality of life and productivity of individuals, families, communities and nations, enabling people to experience life as meaningful and to be creative and active citizens"

Mental ill health affects 1 in 6 of the population and is strongly associated with life events, lower social class, being socially isolated, long term illnesses and financial and work problems[2]. Anxiety with depression is the most common disorder. There are many symptoms of mental health and stress that are experienced by a large number of people particularly sleep problems. The cost of mental ill health is £12.5 billion to the NHS and £23.1 billion to the economy[3].

[1] WHO European Declaration on Mental Health (2005)
[2] See pages 22-26
[3] Sainsbury's centre for mental health (2003) Economic and Social costs of mental health in England

The Three Main Theories Linking Health with the Natural Environment

Biophilia[4]

- Biophilia is an evolutionary theory defined *as "the innately emotional affiliation of human beings to other living organisms. Innate means hereditary and hence part of ultimate human nature"*. It is proposed to be a genetic sequence that has been programmed over one million years of evolution to respond positively to natural environments to help us survive and thrive. The theory proposes that even now we are attracted to these environments where we feel more content and function more effectively. The next two theories show how this genetic "watermark" may affect our mental health and wellbeing.

Attention Restoration Theory[5]

- The Attention Restoration Theory is based on two areas of attention in our lives. Direct attention involves concentration, it is hard work and focuses on generally uninteresting subjects which we have judged as important. Interesting subjects with less importance (distractions) have to be blocked out and this causes tiredness. Indirect attention or fascination holds our concentration with little to no effort. This allows our brain to be restored so that we can return to direct attention. The natural environment provides the most effective restorative environment particularly when it allows the following four qualities: **Being away** from day to day routine, **fascination**, a feeling of **extent** allowing exploration and a **compatibility** to our expectations. However even looking at a natural landscape can help our brain recharge and resume direct attention. There are now over 100 studies that have supported this theory. Attention restoration takes place in the right frontal cortex of the brain and may have an evolutionary

[4] Wilson EO (1984) Biophilia: The Human Bond with Other Species. Cambridge: Harvard University Press.
[5] Kaplan R and Kaplan S (1995) The experience of nature: A psychological perspective. Ann Arbor, MI: Ulrich's. in Kaplan S. The restorative effects of nature: Toward an integrative framework. Journal of Environmental Psychology,15,169-182.

origin in which a healthy environment and remaining alert and focussed increased chances of survival.

Psycho-physiological Stress Recovery Theory[6]

- The Psycho-physiological stress recovery theory is based on empirical findings of an immediate positive response to views of nature. This response causes a rapid reduction in stress (Blood pressure, muscle tension pulse rate) usually within minutes of exposure of nature and is most obvious when the body is already stressed[7]. The theory assumes that this is an inherent reflex associated with the oldest part of the brain, the limbic system. It proposes that throughout the 1 million years of evolution those that have possessed this immediate recovery will have a greater chance of survival by remaining in areas of safety and food, and remaining mentally alert after stressful situations. As with the Biophilia hypothesis it is assumed to be a result of some deep genetic code.

The three main theories of how humans can be restored by views or sounds of the natural environment are still being developed as new research outcomes are added. Biophilia hypothesis explains how over 1 million years a genetic imprint has become established that can relate to the savannah-like environment where humans have spent over 95% of their development[8]. The two restorative theories (Attention Restoration Theory (ART) and Psychophysiological stress recovery theory) both try to explain the mechanism by which restoration can take place. The main difference is that ART is a more voluntary method that affects thought processes and so measured by psychological parameters, whereas the Psychophysiological stress recovery theory is an involuntary reaction based older part of our brain and which is measured physiologically.

These theories are discussed when trying to explain the findings in this report.

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[6] Ulrich RS (1983) Aesthetic and affective response to natural environment in Altman I and Wohlwill JF (Eds) Behaviour and the Natural Environment. New York:Plenum, pp85-125.
[7]. Ulrich R, Simons RF, Losito E, Fiorito E, Miles MA and Zelson M (1991) Stress Recovery during Exposure to Natural and Urban Environments. J Env Psychology 11, pp201-230.
[8] Wilson EO (1984) Biophilia, Cambridge: Harvard University Press ISBN 0-674-07442-4

Nature and Children

Extinction of Experience

An adult's attitude to the environment and time spent in green space is strongly influenced by their experience as a child. Children who spend time in woodland with friends or alone without parental supervision are the most likely to visit and enjoy woodland as an adult. These adults are also more likely to describe woodland as "magical" and are less anxious when visiting woodland alone. The critical age of influence appears to be before 12yrs. Before this age contact with nature in all its forms but in particular wild nature appears to strongly influence a positive behaviour toward the environment. The sense of freedom of unstructured play that occurs in nature creates a source of independence and inner strength that can be drawn upon during stressful situations for the rest of their life[9].

Some researchers[10] describe the lack of connection between children and the natural environment as an "extinction of experience". This means that each generation will pass on less experience of the natural environment and as policy makers and future environmentalists they will have a poorer understanding of nature and so give it less value.

Nature and Self Discipline in Children

Children's ability to concentrate and be more self-disciplined has been associated with contact to nearby nature. Girls in particular are more likely to benefit if they live in an urban area with views of trees and grass, a result which is valid even when controlled by social class and income[11]. Crime and poor school achievement are associated with low levels of self-discipline, impulsive behaviour, immediate gratification and inattention that

[9] Wells NM and Lekies KS (2006) Nature and the life course: Pathways from adulthood Nature Experiences to adult Environmentalism. Children, youth and environments 16(1).
[10] Pyle RM (1978) The Extinction of Experience. Horticulture 56, 64-67
[11] Taylor AF, Kuo FE and Sullivan WC (2001) Views of nature and self-discipline: vidence from inner city children JEVP 21 Suppl.

have all been shown to improve by contact with nature[12]. Increasing the amount of accessible natural environment should be considered as an innovative and equitable method of increasing overall performance and ability for inner city children.

Teenagers and Nature

Teenage years are a time when children develop an identity of their own. During this brief time there appears to be a reduced affinity with nature in preference to time with their peers. Nature can be used to increase social opportunities and provide the location for adventure activities for teenagers. However, research has found that in all societies there is a return to a relationship with nature from the age of 19yrs, making the teenage interlude a brief break to a lifelong relationship[13].

Nature and Children's Play

Play is an essential part of normal childhood development. Children have to play in order to develop normally. Play develops a child's co-ordination, strength and social skills, and helps them to develop a relationship with their environment. Children prefer natural environments to play in as these help develop all types of play. In contrast to man-made environments, a natural setting can create more imaginative play and so prevent the dominance of a hierarchy based on physical strength that encourages bullying. Bullying is also increased by boredom and overcrowding in a playground. Natural vegetation and other natural features can create enclosed areas to help different groups play together and create varied activities suitable for different age groups leading to better overall concentration and motor skills[14] [15].

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12 See pages 85-87

13 Kaplan R and Kaplan S (2002) Chapter 4: Adolescents and the Natural Environemnt: a time out? Children and Nature. The MIT Press

14 Lester S and Maudsley M. (2006) Play Naturally: A review of Children's Natural Play. Commissioned by the Children;s Play Council.

15 Moore R and Wong H. (1997) Natural Learning. In Creating Environments for Rediscovering Nature's Way of Teaching. Berkley: MIG Communications

Mental Health in Children

1 in 10 boys and 1 in 18 girls aged 5-10yrs have a diagnosed mental health disorder. Those children aged 11-17yrs have higher levels with 1 in 8 boys and 1 in 10 girls. Those at high risk are those in lower social class and young offenders. There is a steady increase in the use of medication in childhood mental illlness. More than 40,000 children now use anti-depressants, following a sharp rise over the past 5 years. In 2002, there were 29,400 female suicide attempts and 14,500 male suicide attempts in young people under the age of 25 yrs. A recent study has placed Britain 21st out of 25 European States for wellbeing in children. They have poorer relationships, engage in riskier behaviour and suffer from worse health than their European counterparts[16].

Children with ADHD and Nature

ADHD is a significant public health problem affecting 5-10% of school children in the UK[17]. It is characterized by overactive and impulsive behaviour and difficulty in paying attention, causing disruption to those around and reducing the chance of success as an adult. Children undertaking outdoor activities in nature appear to improve symptoms of ADHD by 30% compared to urban outdoor activities and three fold compared to the indoor environment[18]. All children with ADHD may benefit from more time in contact with nature, greener routes to school and better views from their windows.

Children, Stress and Nature

Children with stressful life events are more likely to develop mental health problems. There is evidence that children that experience a high number of stressful life events are less stressed and have a higher global self worth the more they are exposed to nature[19].

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16 See pages 67-71

17 Taylor E, Sandberg S, Thorley G and Giles S (1991) The Epidemiology of Childhood Hyperactivity. Maudsley Monograph. London: Oxford University Press.

18 Faber Taylor A, Kuo F and Sullivan W (2001) Coping with ADD. The Surprising Connection to Green Play Setting. Environment and Behaviour. 33 Jan 2001 pp54-77.

19 Wells NM and Evans GW (2003) Nearby Nature; A Buffer of life stress among Rural Children. Environment and Behaviour, vol 35, No3 311-330.

Some preliminary work shows that woodland can provide a sanctuary for both rural and urban children and reduce self-reported stress.

Aggression and Nature

Several studies support the belief that nature can reduce aggressive behaviour, possibly due to its restorative process in the brain that helps reduce irritability. These studies range from domestic violence in the inner city[20], to aggressive behaviour in Alzheimer's patients[21]. If nature in inner city areas can reduce some violence by even small amounts then this should be seen as not only a public health intervention, but one that could have large social implications. The positive affect of green space appears to be entirely due to improving attention functioning.

Crime and Nature

The Attention Restoration Theory (ART) shows that with increased contact with nature the brain can be restored from fatigue and so reduce many unwanted symptoms such as impulsive behaviour, irritability and aggression. Studies[22] point to 50% less crime and domestic violence in families with views of increased vegetation in a poor housing estate compared to identical blocks with no vegetation. If this is true then the presence of nature in the inner city residential areas should be an essential part of design rather than seen as just aesthetically pleasing.

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[20] Kuo FE and Sullivan WC (2001). Aggression and Violence in the inner city: Effects of Environment via Mental Fatigue. Environment and Behaviour 33 No4 July 2001 543-571.
[21] Whall AL, Black ME, Groh CJ, Yankou D, Kupferschmid BJ, and Foster NL. (1999) The effect of natural environments upon agitation and aggression in late stage dementia patients. Journal of Health Safety, Compliance & Infection Control, 3(1), 31-35.
[22] Kuo FE and Sullivan WC (2001) Environment and Crime in the inner City. Does vegetation reduce crime

Nature and the Elderly

There is good empirical evidence that the elderly value contact with nature very highly[23]. This involves fresh air, and experience of nature through the senses of sight, smell, touch, and hearing. Access is important, and since an elderly person's world is reduced as they become less active, access to even a small pocket of nature will be important. Older people can benefit from gardening due to increased physical and mental activity, a sense of purpose and meeting friends. This contact with nature significantly improves concentration, and with patients with dementia it can introduce positive experience, improve their sense of coherence, and reduce aggression and agitation[24].

Nature and Hospitals

Patients universally agree that being in contact with nature improves their recovery from illness, operations or mental ill health[25]. For centuries, hospitals have been built within grounds surrounded by trees, or with small gardens or courtyards that can be seen from the patient's bed or visited from the ward. However, this practice has stopped and has been replaced by artificial lighting, windowless rooms and even abstract art that actually increases stress and anxiety in patients.

There is good evidence that patients recovering from illness benefit from contact with nature. Stress is reduced and there is greater satisfaction, a reduction in need for strong painkillers and greater ability to cope with the demands of treatment and understanding of the diagnosis[26]. It would appear that hospitals without any accessible or viewable natural green space are suboptimal as locations for medical treatment and recovery.

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[23] Talbot JF and Kaplan R (1991). The Benefits of nearby nature for elderly apartment residents. International J Aging and human development, vol. 33(2) 119-130, 1991.
[24] Ottosson J and Grahn P (2005) A comparison of leisure time spent in a garden with leisure time spent indoors: On measures of restoration in residents in geriatric care. Landscape Research 30 1 23-55 Jan 2005.
[25] Cooper, Marcus and Barnes (1995) Gardens in Healthcare Facilities: Uses, Therapeutic Benefits, and design considerations. Martinez, CA: The Centre for Health Design.
[26] Ulrich RS (1984) View through window may influence recovery from surgery. Science 224, 420-421.

Nature and Sense of Place

A natural environment can strengthen the community by increasing the amount of contact people have outdoors[27]. The natural environment is inclusive of all ages, which helps to engage all parts of a community. A sense of place describes an attachment to a place that is an important part of someone's sense of identity and creates a feeling of belonging. Place dependence describes the perceived strength of association between a person and a specific place. Place identity describes the integration of the person's "self" that develops in relation to the physical environment.

The natural environment has a strong influence on peoples' relationship with place, and is consistently stated as their preferred place[28]. The natural environment is therefore important in creating a sense of belonging and identity, which in turn has a positive effect on mental health.

Nature and Communities

"Social Relations and networks are life-enhancing and contribute to longevity"[29]. The natural environment contributes to social cohesion by providing inclusive places to meet. Most studies[30] show a positive effect with up to a 90% increase in individuals in green space compared to barren space and 83% more people socialising. However, for the elderly any improvement would be very significant, as social integration is most beneficial to them.

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27 Kuo FE, Sullivan WC, Coley RL and Brunson L (1998) Fertile Ground for Community:Inner-City Neighbourhood Common Spaces. Am J Comm Psychology 26, 6, 1998.
28 Korpela K and Hartig T (1996) Restorative Qualities of favourite Places. J Environ. Pyschology 16, 221-223.
29 Berardo FM (1985) Social networks and life preservation. Death studies, 9(1), 37-50
30 Sullivan WC, Kuo F and Depooter SE (2004) The Fruit of Urban Nature: Vital Neighbourhood Spaces. Environment and Behaviour 36(5) 678-700.

2. Recommendations

Recommendation 1: Research The main research funders to work together in this interdisciplinary area to include the relationship between health and the natural environment as a theme for future rounds of funding.

Recommendation 2: Planning Local authorities should work with public health to understand the value of green space as a resource to benefit the physical and mental health of a local population and surrounding community, and to maintain this healthy environment for future generations to enjoy and utilise for their well-being.

Recommendation 3: Hospital Estates. For hospitals and care homes to have quality measures that include views of trees or grass from a window or access to a garden. These criteria could be developed by the healthcare commission, local authorities, NHS estates and PCTs.

Recommendation 4: Education: For government to encourage schools to reconnect children to the natural environment through more school trips, outdoor lessons in green space and creating more imaginative play areas using vegetation.

Recommendation 5: Social Marketing: For DH, Natural England, Cabe Space, land owners, health and environmental NGOs and the voluntary sector to work together to understand and lift the barriers that prevent people from spending more time in the natural environment.

Recommendation 6: The NHS: The NHS should include contact with nature and outdoor access in the tools it uses to treat and prevent health problems. The environment sector should facilitate this by providing access to nature in a way that supports health needs.

Recommendation 7: Evaluation: Evaluation of projects that change the availability of accessible green space should consider this as a potential change to health resources.

Part 1: How Can the Natural Environment Affect Mental Health and Wellbeing?

3. Wellbeing and Mental Health

"There is no health without mental health. Mental health is central to the human, social and economic capital of nations and should therefore be considered as an integral and essential part of other public policy areas such as human rights, social care, education and employment."

"Mental health and mental wellbeing are fundamental to the quality of life and productivity of individuals, families, communities and nations, enabling people to experience life as meaningful and to be creative an active citizens".[1]

Wellbeing

The WHO Quality of Life group defines wellbeing as:

"*An individual's perceptions of their position in life in the context of the culture and value systems in which they live and in relation to their goals, expectations, standards and concerns*".

The Sustainable Development Research Network[2] have divided wellbeing into:

1) Objective and subjective
2) Hedonic and Eudaemonic wellbeing

Objective wellbeing refers to the material and social circumstances believed to foster or detract from an individuals or community's sense of wellbeing. This may include housing quality, GDP, income and employment, educational attainment and poverty.

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[1] WHO European Declaration on Mental Health (2005)
[2] Sustainable Development Research Network (2006) Briefing 3 "Wellbeing Concepts and Challenges" www.sd-research.org.uk/

Subjective measurement of wellbeing is based on survey questions to rate their satisfaction or happiness. However there is disagreement about how the emotional aspects of wellbeing relate to the overall definition and measurement of subjective wellbeing.

Hedonic wellbeing draws upon the hedonic tradition of philosophy which consists of three elements:

- Life satisfaction
- The presence of positive mood
- The absence of negative mood.

Hedonic happiness is therefore primarily associated with self satisfaction.

Eudaemonic academics separate wellbeing from happiness so that not all sources of pleasure foster wellbeing. Instead it is argued that the realisation of human potential rather than simply life-satisfaction that is central to wellbeing[3].

Wellbeing is therefore a combination of material happiness and satisfaction and a realisation of a person's full potential.

Mental Health

The WHO states that "Mental health has been defined variously by scholars from different cultures. Concepts of mental health include subjective well-being, perceived self-efficacy, autonomy, competence, intergenerational dependence, and self-actualization of one's intellectual and emotional potential, among others. From a cross-cultural perspective, it is nearly impossible to define mental health comprehensively. It is, however, generally agreed that mental health is broader than a lack of mental disorders."

[3] Ryan R. and Deci E. (2001) On happiness and human potentials: A Review of research on hedonic and eudaimonic wellbeing in S Fiske (ed) Annual Review of Psychology (Annual Reviews Inc., Paolo Alto California).

The Mental Health Foundation gives a more practical description:

With good mental health, we can:

- *Develop emotionally, creatively, intellectually and spiritually*
- *Initiate, develop and sustain mutually satisfying personal relationships*
- *Face problems, resolve them and learn from them*
- *Be confident and assertive*
- *Be aware of others and empathise with them.*
- *Use and enjoy solitude*
- *Enjoy life and have fun*
- *Laugh both at ourselves and at the world.*

Downie has developed a model in which both ill-health and well-being are interconnected[4]. In his model positive health includes true well-being and fitness which includes autonomy.

Autonomy is the positive part of health that gives us a sense of purpose, control and hope. It is the part that drives us forward and makes us look forward to life, taking opportunities when we see them. It gives us a healthy capacity to cope during difficult situations. Autonomy is achieved by empowerment. This has three main targets:

- To have control of one's life,
- To express our own will, and
- To develop talents.

In this report, the terms 'mental health' and 'wellbeing' are more than the absence of depression, anxiety, stress, and behaviour problems. They are the positive side of autonomy: having the resource and capacity to cope with the strains of everyday living; having a purpose and meaning in life so that we can add value to our world.

[4] Downie RS, Tannahill C and Tannahill A (2000). Health Promotion Models and Values. 2nd edition Oxford, Oxford University Press

Perhaps the most succinct definition is from the old Health Education Authority (HEA), which defined mental health as:

"*The emotional and spiritual resilience which enables us to enjoy life and to survive pain, disappointment and sadness – a positive sense of well-being and an underlying belief in our own worth and the dignity and worth of others*." [5]

Mental ill health and the environment

So where does mental health meet the natural environment? This report will examine theories that explain how evolution has influenced our present relationship with the environment. It will look at how mental health has been described only in terms of human relationships with very little work aimed to understand the relationship between the individual and environment.

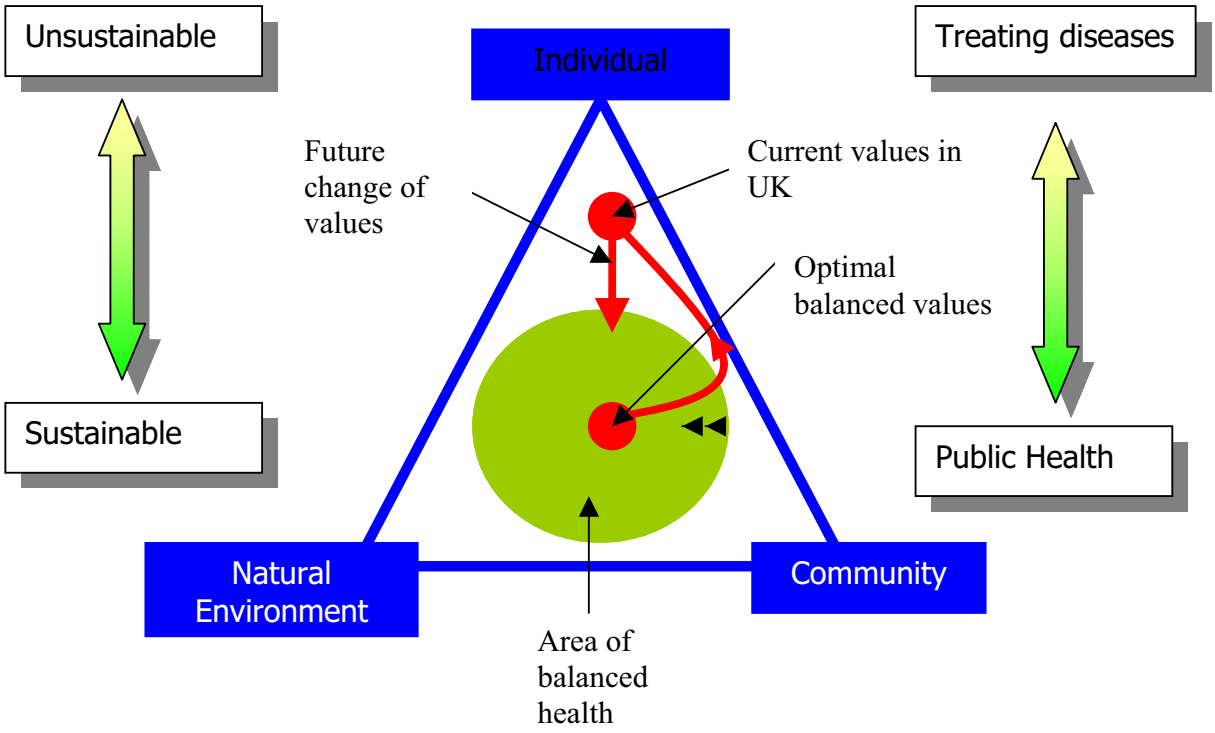
Antonovsky[6] proposed the theory of sense of coherence (SOC). This is a recourse that enables people to manage tension by mobilising resources and cope by finding solutions in a health promoting manner. A part of this SOC is being at one with our environment where it is not a threat or just a void but a positive influence. This means the environment must be:

- Understandable,
- Manageable
- Meaningful.

This provides what is called coherence i.e. it all makes sense and fits. In fact, there is a conflict between seeing the environment with all its complexity and seeing it in a simplified more manageable form[7]. Wild untamed nature may not always be the preferred landscape for some people to enjoy, as they may not feel safe or secure. Structure is required for many people to be able to benefit from the restorative benefits

[5] Health Education Authority (1997) Mental Health Promotion: a quality framework.
[6] Antonovsky A. (1979) "Health, Stress, and Coping": New perspectives on mental and physical well-being. San Francisco: Jossey-Bass Publishers.
[7] Neuberg SL and Newsom JT (1993). Personal need for structure: individual differences in the desire for simple structure. Journal of Personality and social Pyschology 65, 113-131.

of nature. This is a result of our brains trying to create order in an infinitely complex world[8].



Box 1 (*Bird W, presented at UKPHA Call for action: Edinburgh 2007)*

This diagram explains the values held by society. The triangle demonstrates the three main values of individual, community and environment (natural). The circle represents the area where the values are in a balanced proportion leading to the broader definition of health and wellbeing. After 10,000 generations, mankind developed a position where these values were balanced and this represents the centre. As we became urbanised our values shifted away from the environment. More recently over the last 20 years, we have shifted our values again away from community and environment and towards the individual. Valuing the individual at the expense of the environment and community is not only a less sustainable way of life but favours healthcare that treats disease rather than promoting supportive communities and environments. To regain a sense of wellbeing it is argued that we should change our values and reconnect with the natural environment and community in which we live and work. This report provides some of the evidence to help this process.

[8] Van den Berg A (2003) Personal Need for Structure and Environmental Preference. In Human decision making and environmental perception: Understanding and assisting human decision making in real life settings. Liber Amoricum for Charles Vlek. Ed Hendrick L, Jager W, Steg L.

IN SUMMARY

Mental Health and Wellbeing are more than the absence of disease or disability. It is a relative concept that is hard to define but is balanced between self satisfaction achieving ones potential and coping well with adversity. The natural environment has to be understandable and encourage a sense of belonging. This may mean that the natural environment has to be adapted to be acceptable to different groups of people.

The Burden of Mental Health.

About one in six adults suffers from mental health problems at any one time[9], and[10],[11]:

- Around 300 people out of 1,000 will experience mental health problems every year in Britain;
- 230 of these will visit a GP;
- 102 of these will be diagnosed as having a mental health problem;
- 24 of these will be referred to a specialist psychiatric service; and
- 6 will become inpatients in psychiatric hospitals.

According to the Office for National Statistics 2000 survey, the most common mental health condition is 'mixed anxiety and depression', (confusingly this is one diagnosis) and is experienced by 9.2 % of adults in Britain. This is followed by general anxiety at 4.7 % and depression (without the symptoms of anxiety) at 2.8 %. See Table 1.

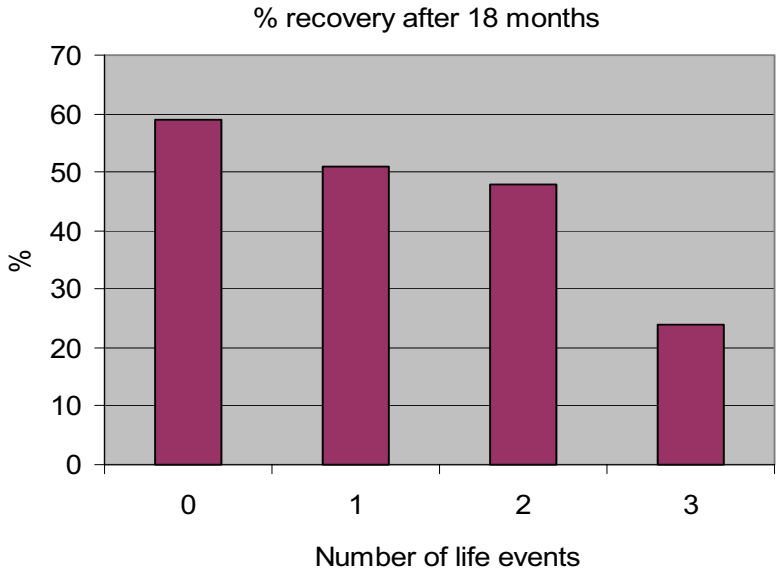
[9] ONS (2000) Psychiatric morbidity among adults living in private households in Great Britain.
[10] Goldberg, D. & Huxley, P, (1992) Common mental disorders a bio-social model, Routledge.
[11] Mind the mental Health Charity 2006
http://www.mind.org.uk/Information/Factsheets/Statistics/Statistics+1.htm#_ftn2

Diagnosis	**Female**		**Male**		**All**	
	1993	2000	1993	2000	**1993**	**2000**
Mixed anxiety and depression	10.1	11.2	5.5	7.2	**7.8**	**9.2**
Generalised anxiety disorder	5.3	4.8	4.0	4.6	**4.6**	**4.7**
Depressive episode	2.8	3.0	1.9	2.6	**2.3**	**2.8**
Phobias	2.6	2.4	1.3	1.5	**1.9**	**1.9**
Obsessive compulsive disorder	2.1	1.5	1.2	1.0	**1.7**	**1.2**
Panic disorder	1.0	0.7	0.9	0.8	**1.0**	**0.7**
Any neurotic disorder	19.9	20.2	12.6	14.4	**16.3**	**17.3**

Table 1. The % prevalence of mental health disorder between 1993 and 2000. (ONS 2000, op cit).

In a recent study for the ONS it was found that after 18 months about 50% of people with a mental health problem had recovered. Only 21% of the long term sick or disabled group had recovered compared to 60% of those in employment. Life events were also important risk factors, with 59% of those with no life event recovering, which fell to 24% after three life events. See figure 1.

Figure 1. The % recovery from a mental health disorder compared to the number of life events that took place during the 18 month recovery period[12].



[12] ONS, 2001, Psychiatric morbidity among adults living in private households in Great Britain

Suicidal Thoughts

About 4% of the population have suicidal thoughts at some time each year although 50% will recover within 12 months[9]. The 16-24 year age group has the highest incidence (10%), but are the most likely to recover (66%). Apart from existing mental ill health, the most predictive factors were: not being in a stable relationship; living alone and low socio-economic position; long term sick or disabled; low levels of social support; the occurrence of several stressful life events; and smoking and illicit drug use.

Physical Health

There is a strong association between mental and physical health[9]. 23% of those with a persistent mental health disorder have a low physical health score, compared to 1% with no mental health disorder. Among those with a persistent mental health disorder 66% had reported a long-standing physical problem. Diseases of joints and nervous system were most strongly related with mental health problems.

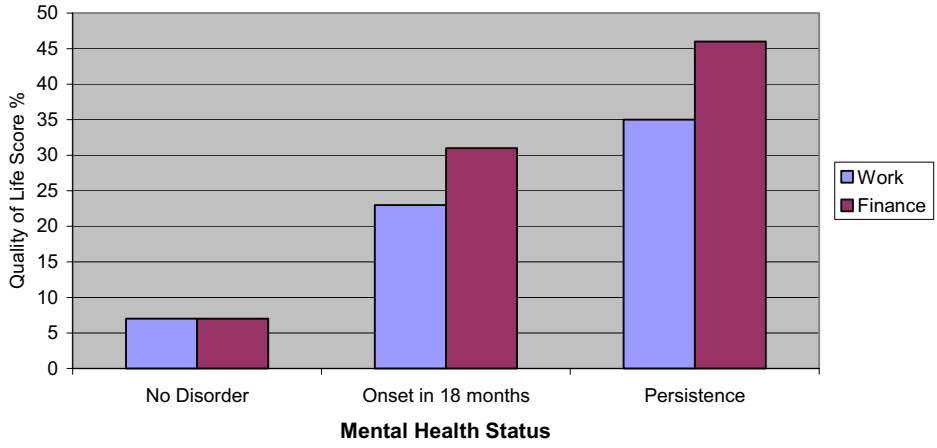
Quality of Life

There is a strong correlation between quality of life and mental health problems. More specifically, mental health problems are associated with problems of money and work. See figure 2: a very low score on the general feeling about life was reported in only 3% of those with no mental health disorder and 34% with a persistent disorder (over 18 months).

Social support

Close friends and relatives form an individual's primary support group. Adults with a primary support group of 3 people or fewer are at greatest risk of psychiatric problems. In the ONS study, those with a severe lack of perceived social support had double the risk of persistent mental health disorder (15%) compared with those with no mental health disorder (6%).

Figure 2. Quality of life scores relating to money and work for groups with different mental health status[5]



Symptoms of Mental Health Distress

There are many symptoms that reduce our functioning through stress or mental ill health. The results of the ONS household survey are shown in table 2:

Table 2. Rate of mental health diagnoses 1993 & 2000. [11]

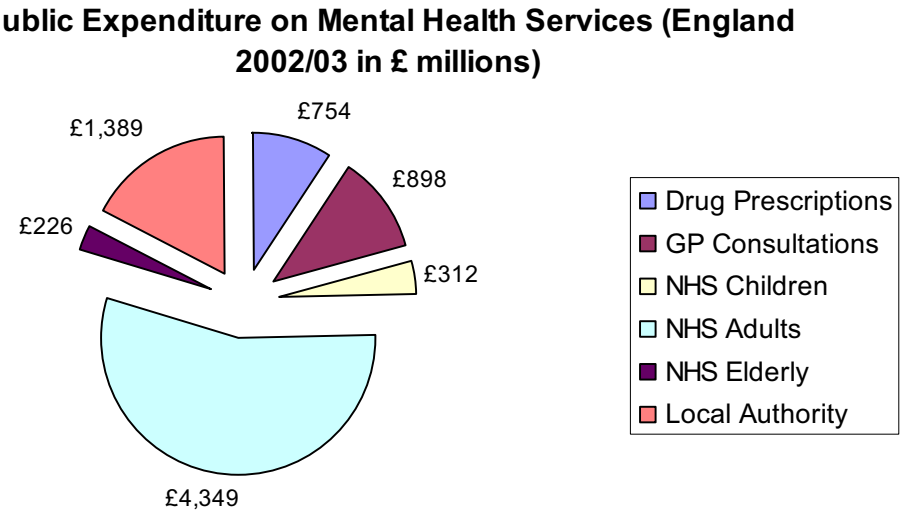
Diagnosis and % rate (past week)	Female		Male		All	
	1993	2000	1993	2000	1993	2000
Sleep problems	28	34	21	24	**25**	**29**
Fatigue	33	33	21	23	**27**	**28**
Irritability	25	24	19	20	**22**	**22**
Worry	23	23	17	18	**20**	**20**
Depression	11	12	8	11	**10**	**12**
Concentration and forgetfulness	10	11	6	9	**8**	**10**
Depressive ideas	11	12	7	9	**9**	**10**
Anxiety	11	10	8	9	**10**	**9**

The Cost of Mental Health

The estimated total cost of mental health in England is £77bn[13]:

- £12.5 billion for care provided by the NHS, local authorities, privately funded services, family and friends. Public expenditure is £7.9 billion, of which the NHS makes up £6.5 billion and local authorities £1.4 billion. Family carers and others that look after people with mental health problems on a voluntary basis is estimated by to be worth £3.9 billion and is termed informal care. The remaining £0.7 billion is for private and other care;
- £23.1 billion in lost output in the economy caused by people being unable to work (paid and unpaid);
- £41.8 billion in the human costs of reduced quality of life, and loss of life, amongst those experiencing a mental health problem.

Figure 3. Breakdown of £7,928m Total of Public Expenditure on Mental Health



[13] Sainsbury's centre for mental health (2003) Economic and social costs of mental ill health in England.

About 900, 000 people are claiming incapacity benefit – more than the number of unemployed people claiming jobseekers allowance. In his report[14], Derek Wanless calculated that better mental health care would save £3.1 billion but that this does not account for prevention or promotion of better mental health.

IN SUMMARY

Mental health and wellbeing are not just the absence of disease but a state in which a person is most fulfilled, can make sense of their surroundings, feel in control, can cope with every day demands and has purpose in life. Making sense of our surroundings means that they must appear to have some order to the person. Mental health disorders affect 1 in 6 of the population and are strongly associated with life events, lower social class, being socially isolated, long-term illnesses and financial and work problems. Anxiety with depression is the most common disorder. There are many symptoms of mental health and stress that are experienced by a large number of people, particularly sleep problems.

The cost of mental health is £12.5 billion to the NHS and £23.1 billion to the economy and £41.8 billion.

[14] Wanless D. (2002) Securing our future health: Taking the Long-Term View; HMSO.

4. The Three Main Theories Linking Biodiversity and Humans

What connection do we have with nature? – Three main theories supporting a restorative environment

This report has studied research findings that link the natural environment with mental health, wellbeing and social integration. There are three main hypotheses that seek to provide an explanation of these associations. As evidence is accumulated, there is increasing confidence that natural environments are not just associated with, but are the cause of this improvement in wellbeing. The quality of studies is still not as high as in many medical fields of research. But the consistency of results, dose response (the more nature the better the wellbeing) and sheer volume of work has brought this field of research a long way since the theories were first proposed in the early 1980s.

The Biophilia Hypothesis

The biophilia hypothesis describes the existence of a genetically based, human need and preference to affiliate with nature. Put simply E Wilson, the Harvard biologist who proposed this hypothesis defines biophilia as *"the innately emotional affiliation of human beings to other living organisms. Innate means hereditary and hence part of ultimate human nature*[15]. The Biophilia Hypothesis proclaims a human dependence on nature that extends far beyond the simple issues of material and physical sustenance to encompass also the human craving for aesthetic, intellectual, cognitive, and even spiritual meaning and satisfaction. There are a number of challenging assertions. Among these is the suggestion that the human inclination to affiliate with life and lifelike process is[16]:

- Inherent (biologically based).

[15] Wilson EO (1984) Biophilia: The Human Bond with Other Species. Cambridge: Harvard University Press.
[16] S Kellert p21 in 'The Biophilia Hypothesis' Stephen R Kellert and Edward O Wilson, Ed (1993) Island Press Washington DC.

- Part of our species' evolutionary heritage.
- Associated with human competitive advantage and genetic fitness.
- Likely to increase the possibility for achieving individual meaning and personal fulfilment.
- The self-interested basis for a human ethic of care and conservation of nature, most especially the diversity of life.

Studies have shown that not only do we increase productivity and have health benefits from simply viewing nature from a window but that "*given the option humans choose landscapes … near water from which parkland can be viewed that fit patterns laid down deep in human history on savannahs of East Africa*"[17].

There are important questions that do not fit as neatly such as the hostility that some humans have with different aspects of nature (eg. arachnophobia) and the obvious love of manmade structures such as large buildings, music, the arts could be seen to celebrate man's disconnect from nature. There is also the debate over whether the biophilia hypothesis can be explained purely in genetic terms or through culture, behaviour and learning.

Evidence Supporting the Biophilia Hypothesis.

As the original proposer of this hypothesis, EO Wilson stated: "*Is the mind predisposed to life in the Savannah, such that beauty in some fashion can be said to lie in the genes of the beholder*?"[18]

Imagine the environment of early man, which in fact changed very little over a million years. The grasslands of East Africa where man is thought to have originated would have been scattered with water holes and rivers and the great savannah plains of open grassland with scattered acacia trees. Water would be essential to these hunter-gathers, as well as attracting wildlife to be hunted. Prominences overlooking grass lands

[17] Kahn PH Jr. (1997) Developmental Psychology and the Biophilia Hypothesis: Children's Affiliation with Nature Developmental Review, 17, 1-61.
[18] Wilson EO (1984) Biophilia. Cambridge: Harvard University Press ISBN 0-674-07442-4.

presumably afforded views of approaching threats and trees with relatively low trunks to help climbing away from trouble offering shade and a canopy that does not block the view. Although mankind spread through the world during the past million years it is only in the last 10,000 years that humans turned to settlements and farming. This means that 99% of our genetic history has been as a hunter gatherer bands totally and intimately involved with other organisms and the majority of this time in East Africa[19].

Gordon Orians, professor of Zoology at Washington State University found supporting evidence for three main features that people work hard to recreate:

1. Savannah with abundance of animal and plant food with clear views to detect animals and rival human groups.
2. Topographic relief such as cliffs, hillocks, trees and ridges that offer vantage points and shelter.
3. Lakes and rivers that provide food and drink, and can be used for defence.

Whenever civilisations or individuals have had choice, they tend to live in open tree studded land on prominences overlooking water. Even in urban areas such as in Pompeii, the Romans built gardens with spaced trees and water[20].

The extensive research of Kaplan and Kaplan added more knowledge about the preferred landscape that humans naturally choose when given free choice:

- Water was highly prized element in the landscape.
- Landscapes that were open, yet defined, with "relatively smooth ground texture and trees that can help define the depth of the scene. These were classified as park-like, or Savannah.
- Legibility: the ability of the environment to allow the individual to find their way back.

[19] EO Wilson p32 in 'The Biophilia Hypothesis' Stephen R Kellert and Edward O Wilson, Ed (1993) Island Press Washington DC.
[20] Orians GH (1980) Habitat selection: General Theory and Applications to Human Behaviour, pp49-66 in *the Evolution of Human Social Behavioiur* Joan S. Lockard ed (1980).

- Complexity: monolithic environments were less appealing than complex or varied scenes. However highly complex environments offered no advantage.
- Mystery: this was the ability to acquire more information by entering more deeply into the scene. This would include winding paths and meandering streams.

According to S Kaplan[21] "*There is reason to believe that selection pressures in early humans favoured acquiring new information about ones environment [Mystery] while not straying too far from the known [Legibility] could be seen in the context of early man. Trees and water offered support essential to human survi*val".

So do people with no direct experience of savannah still prefer it to other more familiar environments? Orians and Heerwagen[22] helped to answer this question by showing people in the US, Australia and Argentina photographs of several trees. The most popular were those resembling the savannah trees, whose trunks branched low down thus providing moderately dense cover. The least popular for all groups were trees with high trunks and whose canopy was either very skimpy or very dense.

In other work, Orians and Heerwagen[23] looked at the preference of the great 18th century English landscape architect Humphrey Repton when designing parkland at a time when East African savannah would not have been widely observed from Europe. This showed that to create the most preferred landscape Repton added trees to pasture land and these trees were low with moderately dense canopies in a similar way to the East African plains.

[21] Kaplan S (1992) (Page 585) Environmental preferences in a knowledge-seeking , knowledge-using organism. In.J.H. Barkow, L.Cosmides, &J.Tooby (Eds) The adapted mind: Evolutionary psychology and the generation of culture (pp581-598).
[22] Orians GH and Heerwagen JH (1992) Evolved responses to landscapes.JH Barkow, L Cosmides, and J Tooby (Eds. The adapted mind evolutionary psychology and the generation of culture (pp555-579). New York: Oxford University Press.
[23] Heerwagen JH, and Orians GH (1993) Humans, habitats, and aesthetics. In Stephen R. Kellert & Edward O. Wilson (Eds.), The biophilia hypothesis (pp. 138-172). Washington, DC: Island Press.

Similar results of a savannah like preference were found in a recent survey by the Forestry Commission looked at people's preference to forests and found that people preferred broad-leaved trees (55%) to coniferous trees (13.7%); small woodlands (57%) to large Forests (22%); varying heights (75%) compared to similar heights (9.9%); a mix of trees and open spaces (83%) to just trees (5.3%); randomly spaced trees (77.4%) compared to regularly spaced (10%). (other percentages were "equal preference" and "neither")[24].

Children showed similar responses when shown photographs of different biomes of mixed hardwood forest, tropical rainforest, boreal forest, savannah and desert with all preferring the savannah picture. The exception was older children who lived in areas of mixed hardwood forest and found this equally attractive possibly because of local experience[25].

In a review of hundreds of studies, Kaplan and Kaplan concluded that:
"*The immediate outcomes of contacts with nearby nature include enjoyment, relaxation, and lowered stress levels. In addition, the research results indicate that physical wellbeing is affected by such contacts*.

People with access to nearby –natural settings have been found to be healthier than other individuals. The longer term, indirect impacts also include increased levels of satisfaction with one's home, one's job and with life in general……as psychologists we have heard but little about gardens, about foliage, about forests and farmland…perhaps this resource for enhancing health, happiness, and wholeness has been neglected long enough.

…viewed as an amenity, nature may be readily replaced by some greater technological achievement. Viewed as an essential bond between humans and other living things, the natural environment has no substitutes".

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24 Willis KG, Garrod G, Scarpa R, Powe N, Lovett A, Bateman IJ, Hanley N and Macmillan C. (2003) The social and environmental Benefits of Forests in Great Britain. Report for the forestry commission by University of Newcastle 2003.
25 Balling, JD and Falk JH (1982) development of visual preference for natural environments: Environment and Behaviour, **14**,5-28.

IN SUMMARY

Biophilia is an evolutionary theory that explains mans affinity with nature so that we still have a yearning for an environment that was associated with survival during 99% of our evolution. It proposes an explanation of a genetic sequence that has been programmed over one million years of evolution to respond positively to natural environments to help us survive and thrive. This is demonstrated by the desire to live high up with a view over water with scattered trees and pastoral land with good visibility.

Nature Recharging the Brain - Attention Restoration Theory

In the 1980s, two psychologists Stephen and Rachel Kaplan, theorised about the effects that the natural environment had on the brain. This theory is now being supported by new techniques in neuro-imaging and by many published papers, the most important of which are cited in this report[26].

The first person to articulate the role of concentration was W James in 1892[27]. He differentiated direct attention, (which is intentional and voluntary) from indirect attention or fascination, (which is involuntary and automatic and requires little effort).

Involuntary attention or fascination is effortless and is held when the subject is interesting and therefore automatically holds our attention. This form of attention is a pleasurable way of processing environmental information and therefore comes at no cost to the human in way of tiredness. Examples are watching animals and birds, looking at natural scenes and water, and also watching sport and listening to music.

The second type is **directed attention** that involves a forced and burdensome form of focussed attention that requires great effort to remain focused on the task and process

[26] Kaplan R and Kaplan S (1995) The experience of nature: A psychological perspective. Ann Arbor, MI: Ulrich's. in Kaplan S. The restorative effects of nature: Toward an integrative framework. Journal of Environmental Psychology,15,169-182.
[27] James W (1892) Psychology: the briefer course. New York: Henry Holt.

the information. Effort is required as the stimulus is weak and of little interest. Its importance is strong so it takes effort to block out more attractive but less important distractions. This is mentally demanding, as more appealing external information must be blocked out using the inhibitory control mechanism, as has been shown recently with brain scans (fMRIs)[28]. The scans show that the direct attention is focused in the right frontal cortex of the brain - the same part of the brain that appears to be affected in children with attention deficit hyperactivity disorder (ADHD).

Directed attention is tiring and leads to Direct Attention Fatigue (DAF) so at some point the brain needs a recovery period to be able to resume the task. Examples of directed attention are driving in heavy traffic, study, computer work, phone calls at work etc. In fact, the symptoms of DAF are remarkably similar to the symptoms of a child with ADHD.

The cost of Direct Attention Fatigue (DAF) is a reduced competence and efficiency of the individual and can be summarised in four ways[29]:

1. Individuals with DAF become easily distracted. This is experienced by anyone trying to revise for an exam or listen to a long and uninteresting lecture.
2. DAF leads to planning impairment, with difficulty in exploring future directions or following laid down plans.
3. DAF leads to impulsive behaviour, with little patience, or delay in acting on the first thing that comes to the forefront of the mind.
4. Irritability is a well recognised characteristic of someone who has DAF and is a common feature of over-work and poor sleep.

Direct Attention Fatigue (DAF) is widespread and occurs in particular with those who are ill or carers of those who are ill. It is present in those under stress, over worked, suffering from grief or loss or simply very short of sleep.

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28 Kastner S, De Weerd P, Desimone R and Ungerleider LG (1998) Mechanisms of Directed Attention in the Human Extrastriate Cortex as Revealed by Functional MRI. SCIENCE, Vol 282, 2nd October 1998.

29 S Kaplan (2001) Meditation, Restoration and the management of mental Fatigue. Environment and Behaviour 33(4):480-506.

Stress is now a widespread condition of modern life, with its overload of information, communication and multiple stimuli that need to be processed and selected or inhibited.

It may appear strange why we have such a fragile direct attention, which tires so easily. However, as we evolved, being focused on a subject for too long would leave us vulnerable to attack and many of the areas that needed attention such as animals, food gathering and danger would have been in the fascination (non-tiring type) of attention. DAF is therefore probably a relatively new phenomenon[30].

Recovery from DAF is influenced by the surrounding environment and natural environments in particular. The recovery period needs to involve an environment that provides involuntary attention and that does not use the tiring inhibitory control mechanism. This environment is termed as restorative and allows the inhibitory control mechanism to recover so that direct attention can resume.

The outdoor environment is usually restorative, but must fulfil certain criteria in addition to fascination in order to fully qualify. These four criteria (being away, extent, fascination and compatibility) are based on psychological assessments and were proposed by Stephen Kaplan in 1998.

Criteria for a restorative environment

- Being away

Restorative environments must be in a physically distinct location (they can be two parts of what is thought of as the same place (eg. at home they could be a study and a garden) where the accompanying tasks are not present.

- Extent

The location must be rich and coherent enough to constitute a distinct environment. Restorative environments work best when one can settle into them, and when they

[30] Kaplan S (2002) Some Hidden Benefits of the Urban Forest presented at the IUFRO European Regional Conference, Copenhagen.

provide enough to see, experience and think about to take up the available room in one's head.

- Fascination

This effortless attention is what allows the inhibitory fibres to relax, since they are no longer having to block out distractions. Fascination occurs when looking at nature, water, or by processes of exploring and making sense of the environment.

- Compatibility

There should be compatibility between purpose and inclinations. In other words, the settings must fit what one is trying to do or would like to do. The purpose must meet the activities smoothly and without a struggle[31].

The natural environment possesses all these features in varying degrees: **being away** from everyday work, and providing complex ecosystems, trails and paths for exploration to satisfy **extent.** It provides **fascination** of animals, birds, trees, plants and views and **compatible** activities such as walking, bird watching, and fishing.

Two early studies have supported this theory. The first involved three groups of young adults. One group had a wilderness vacation, another an urban vacation and the third no vacation. After returning, each group completed a proof-reading test that was highly demanding of direct attention. The wilderness group showed significant improvement in scores compared to a decline in performance in the other two groups[32]. In a second study in the same publication, three groups were assigned to a natural environment, urban environment or passive relaxation (listening to soft music and reading magazines). Each group was given a task, and then spent 40 minutes in the selected environment. Again those in the natural setting performed the best in a subsequent proof-reading test.

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[31] Kaplan S (1983) A model of person-environment compatibility. Environment and Behavior 15:311-332.
[32] Hartig T, Mang M and Evans GW (1991). Restorative effects of natural environment experience. Environment and Behaviour, 23, 3-26.

The Kaplans then stated four areas that benefited from Attention Restoration: clearing the mind, recovery from fatigued directed attention, the opportunity to think about personal and unresolved problems, and opportunity to reflect on life's larger questions such as direction and goals. Herzog et al. put these four categories into two groups: 1) Clearing the mind and 2) recovery from fatigued directed attention could be grouped as **attentional recovery**; where as dealing with personal problems and reflection on life's goals were described as **reflection**[33].

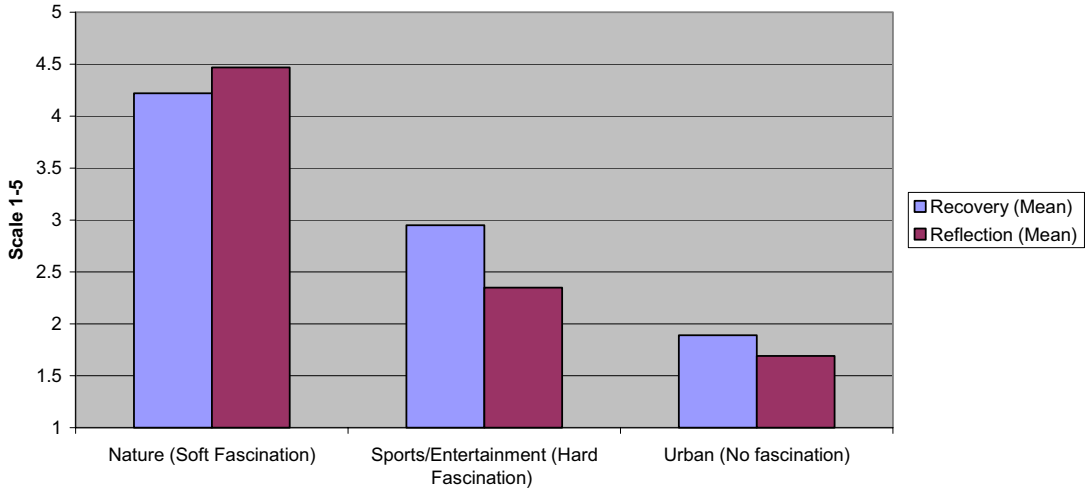
Fascination can be divided into **hard fascination** (watching sport, TV, computer games etc.), which holds ones attention effortlessly and allows *attentional recovery* but excludes space for *reflection* and **soft fascination** (countryside, gardens etc.), which holds one's attention to allow *attentional recovery* but also allows enough space for *reflection*. Areas of **low fascination**, such as urban areas that demand more directed attention, would have both limited *attentional recovery* and limited *reflection*.

A study showed illustrations to 187 students that reflected the three types of fascination. The students were then asked questions relating to how suitable these scenes would be to recover from hard work (attention recovery) and set a life goal associated with a personal problem (reflection).

The theory suggests that recovery should be greatest for nature, less for watching sport and entertainment that involves hard fascination, and least for urban areas that continue to fatigue the brain through directed attention. The results confirm the theory, with the difference between each group being significant ($p<0.01$). The second theory was that reflection would greatest in nature scenes that involve soft fascination and least for both watching sports and urban areas that allow no room for reflection. This was again confirmed in the experiment, with a significant difference ($p<0.01$) between nature and the other two, but no difference between watching sport and urban ($p=<0.621$)

[33] Herzog TR, Black AM, Fountaine KA and Knotts DJ (1997) Reflection and Attentional Recovery as distinctive benefits of restorative environments. J Environmental Psychology: 17, 165-170.

Figure 4. Comparison of how much three environments allowed people to recover or reflect. Note how traditional relaxation of watching sport or TV or computer games (hard fascination) offered significantly less opportunity for reflection, which was similar to an urban environment.



It is now 20 years since the attention restoration theory was first put forward. It is not complete and is likely to be modified as more research is carried out in this area. However, the research so far appears to support the main aspect of restoration and this report will look at specific outcomes that have been measured to contribute to the health of the public.

IN SUMMARY

The Attention Restoration Theory is based on two areas of attention in our lives. Direct attention involves considerable concentration, is hard work and is focused on generally uninteresting subjects which we have judged as important. Interesting subjects with less importance (distractions) have to be blocked out and this causes tiredness. Indirect attention or fascination holds our concentration with little to no effort. This allows our brain to be restored so that we can return to direct attention again. A restorative environment has four qualities, **being away** from day to day routine, **fascination**, a feeling of **extent** allowing exploration and a **compatibility** with our expectations.

The natural environment is the most restorative environment and allows our brain to recharge and resume direct attention. This takes place in the right frontal Cortex of the brain and may have an evolutionary origin in which a healthy environment and remaining alert and focussed increased chances of survival.

Reducing Stress - The Psychophysiological Stress Recovery Theory.

In 1983, Roger Ulrich proposed a theory to explain the influence of a view of nature on health and wellbeing[34]. This is based on a genetic capacity for a restorative response to certain nature settings, which held survival-related advantages for early humans. The basic proposition is that the advantages of restoration were critical for survival so as to favour the selection of individuals who could retain restorative responses to certain nature settings. The fight or flight reflex is a normal response to stress caused by the release of catecholamines (including adrenaline) and results in muscle tension, raised blood pressure, faster pulse, diversion of blood away from the skin to muscle and sweating. All of these factors help the body to cope with a dangerous situation. However, without rapid recovery this stress response would cause damage and exhaustion with limited response to a repeat dangerous situation.

In contrast to Attention Restoration Theory, Roger Ulrich's theory implies that the responses are located in a much deeper part of the brain called the limbic system that generates survival reflexes.

A large body of research on recreational experiences has shown convincingly that leisure activities in natural settings are important for helping people to cope with stress as well as meeting other needs unrelated to stress. Pretty et al. studied 10 case studies involving 263 people undertaking Green Exercise in the UK[35].

Green exercise is any activity undertaken within the natural environment. Although there were no controls of nature alone or exercise alone, the study showed that self-esteem and wellbeing significantly improved overall after the outdoor activity.

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34 Ulrich RS (1983) Aesthetic and affective response to natural environment in Altman I and Wohlwill JF (Eds) Behaviour and the Natural Environment. New York:Plenum, pp85-125.
35 Pretty J, Peacock J, Hine R, Sellens M, South N and Griffin M (2007 in press) Green Exercise in the UK Countryside: The Effects on Health and Psychological Well-Being, and implications for Policy and Planning. J Environmental Planning and Management.

Ulrich states that, due to a genetic remnant of evolution, this theory explains the restorative response to nature, but that there is no disposition to most built environments. He also states that certain natural environments as mentioned in the biophilia hypothesis are more likely to restore. These include:

- Verdant plants
- Calm or slow moving water
- Spatial openness
- Park-like or Savannah-like properties.
- Unthreatening wildlife
- Sense of security

Many studies have demonstrated that after exposure to the natural environment a person's concentration can improve and stress is relieved. Ulrich demonstrated that even showing a videotape of natural surroundings resulted in a much more rapid recovery from a stressful event (see figure 5 and figure 6[36]). There is also evidence that mood and self-esteem can improve simply by looking at natural scenes projected onto a screen compared with urban scenes[37].

[36] Ulrich R, Simons RF, Losito E, Fiorito E, Miles MA and Zelson M (1991) Stress Recovery during Exposure to Natural and Urban Environments. J Env Psychology 11, pp201-230.
[37] Pretty J, Peacock J, Sellens M and Griffin M (2005) The Mental and Physical Health Outcomes of Green Exercise. International Journal of Environmental Health Research. October 2005;15(5):319-337.

Figure 5. Results of 120 stressed students who were randomly assigned to a recovery period consisting of videotapes of three main settings. Notice how rapidly the nature tapes reduced the stress reaction [36] (within 3 mins).

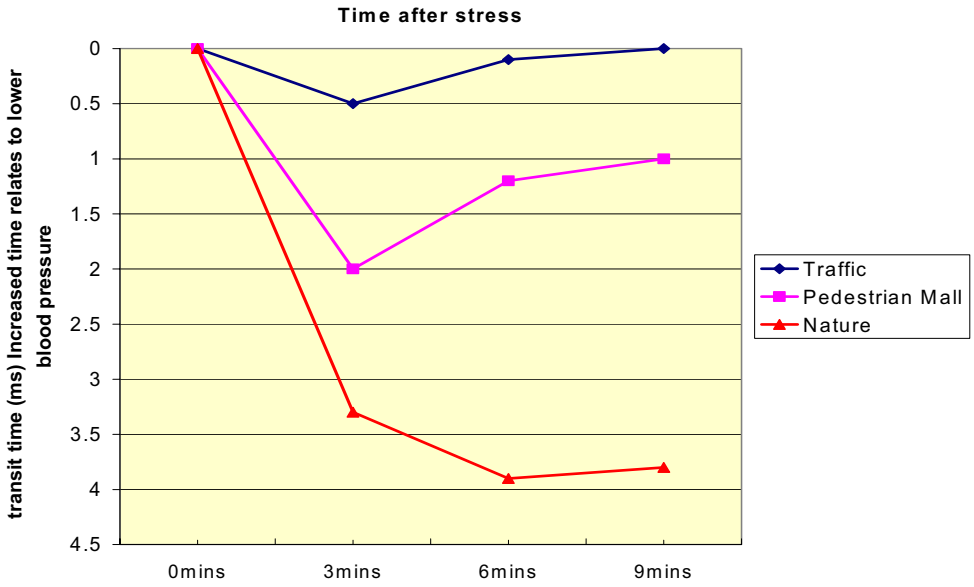
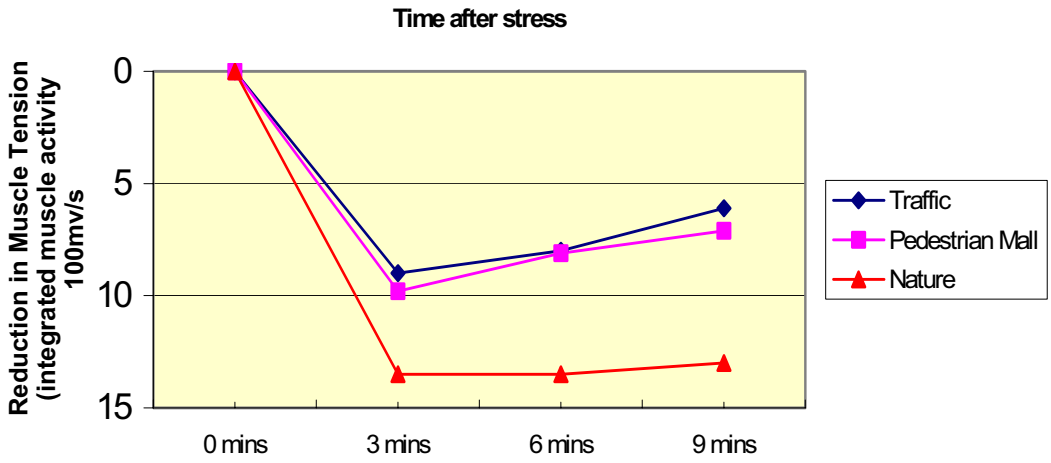


Figure 6. As with figure 5 above, but the muscle tension around the scalp was measured showing a significant reduction in tension for all video tapes. The reaction to nature was more complete and longer lasting [36].



Other researchers have shown results similar to these initial studies. For example, Hartig asked participants to walk through a slide scene of nature and urban environments. The study demonstrated more positive wellbeing through contact with nature compared to contact with urban environments[38] [39].

A novel experiment looked at a simulated video drive using screens measuring 6ft by 4ft. 160 subjects were "driven" to "work" on a 10 min journey. On arrival to work those that had a nature dominated journey had much lower stress (skin conductance $p<0.001$), compared to those that had a journey through a built up area. Physiological measures, such as blood pressure recovery, were much slower after the urban drive compared to the nature-dominated drive[40].

Even electroencephalogram (EEG) evidence shows that alpha wave activity (more relaxed state) is increased when viewing plants with flowers. Nakamura demonstrated that plants with flowers were the most relaxing, followed by plants with no flowers, followed by the plant pot itself. Similar results were achieved when viewing a hedge and a concrete wall[41] [42].

A more recent study looked at 112 randomly selected young adults, who were compared undergoing a nature walk and walking in an urban setting. The results showed that whereas anger decreased and positive mood increased in the nature reserve, the

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[38] Hartig T, Böök A, Garvill J, Olsson, T and Gärling T (1996) Environmental influences on psychological Restoration. Scandinavian Journal of Psychology Vol 37 pp378-393)
Hartig T and Evans GW (1993). Psychological Foundations of Nature Experiences. Environment and Behaviour. Vol 23 pp3-36.

[39] LaumannK, Gärling T and Morten Stormark K (2003) Selective attention and heart rate responses to natural and urban environments. Journal of Environmental Psychology, 23: 125-134.

[40] Parsons R (1991) Recovery from stress during exposure to videotaped outdoor environments. Doctorial dissertation Department of Psychology. University of Arizona, Tucson.

[41] Nakamura R and Fujii E (1993) A comparative Study of the Characteristics of EEG when observing a hedge or a concrete block fence. J of the Japanese Institute of landscape architects. 55: 139-144. (In Japanese)

[42] Nakamura R and Fujii E (1990) Studies of the characteristics of EEG when observing potted plants. Pelargonium Hortorum and Begonia Evansiana. Technical Bulletin of the Faculty of Horticulture of Chiba University. 43: 177-183. (In Japanese)

reverse was true with an urban walk. Blood pressure changes indicated stress reduction in the nature walk but not the urban walk.[43].

There is also evidence that creativity increases with a positive emotional state, so tool making and other initiatives would have been more effective in these savannah-like areas. Creativity involves the novel combination of typically unrelated elements[44]. Positive emotions allow joined up thinking to help solve more complex problems. In other words, those with this genetic code would be smarter and more creative[45]. Rapid restoration within minutes would allow a hunter to become alert more quickly after stress and so reduce the period of vulnerability to attack.

IN SUMMARY

The psychophysiological stress recovery theory is based on empirical findings of an immediate positive response to views of nature. This response causes a rapid reduction in stress, usually within minutes of exposure of nature, and is most obvious when the body is already stressed. The theory assumes that this is an inherent reflex associated with the oldest part of the brain, the limbic system. Throughout the one million years of evolution those who have possessed this immediate recovery have had a greater chance of survival by remaining in areas of safety and food, and remaining mentally alert after stressful situations. It is therefore a result of some deep genetic code, which remains with us to this day.

SUMMARY OF THE THREE HYPOTHESES

The three main theories of how humans can be restored by views or sounds of the natural environment are still being developed as new research outcomes are added. Biophilia hypothesis explains how over 1 million years a genetic imprint has remained that can relate to the savannah-like environment where humans have spent over 95%

[43] Hartig T, Evans GW, Jamner LD, Davis DS and Garling T (2003) Tracking restoration in natural and urban field setting J. Environmental Psychology 23 (2): 109-123.
[44] Mednick SA (1962) The Associative Basis of the Creative Process. Psychological Review. 69:220-232
[45] Isen AM (1985) The Asymmetry of Happiness and Sadness in Effects on Memory in Normal College Students. Journal of Experimental Psychology: General 114:388-391

of their development. The two restorative theories (Attention Restoration Theory (ART) and psychophysiological stress recovery theory) both try to explain the mechanism by which restoration can take place. The main difference is that ART is a more voluntary method (in the right frontal cortex of the brain), which affects thought processes and so is measured by psychological parameters, whereas the psychophysiological stress recovery theory is an involuntary reaction based much deeper in our brain (Limbic system) which is measured physiologically.

The findings in this report are all based on these theories through some mechanism and demonstrate how many health outcomes can benefit from contact with nature.

Part 2: The Evidence on the Affect of the Natural Environment on Mental Health and Wellbeing.

5. Nature, Children and Mental Health

Nature and Children

"Here is this vast savage, howling mother of ours, Nature, lying all around, with such beauty, and such affection for her Children,; and yet we are so early weaned to society, to that culture which is exclusively an interaction of man on man" . Henry David Thoreau (adapted).

Children are fascinated by nature. This can be observed by watching children discovering beetles, worms, making daisy chains, building dens and watching animals and birds. Children's relationship with nature has been taken for granted, but recent evidence shows that this relationship is a fundamental part of development, which helps children reach their full potential.

Urban children are often trapped in environments that provide little opportunity for self-discovery and natural environmental experience. This has resulted in children now spending less time outdoors and in particular playing with friends in green areas.

Spontaneous unregulated play in neighbourhood spaces, particularly in affluent areas of cities, is becoming an activity of the past. Children have lost access to traditional play areas including streets and wild spaces[46]. This is due in part to:

1. Parental fear of: traffic, bullying and stranger danger,
2. Loss of natural spaces for play,
3. Perceptions of what is best for children.

[46] Tranter P and Doyle J (1996) Reclaiming the residential Street as Playspace. " International Play Journal:481-497.
Valentine G and McKendrick JH (1997). Children's outdoor play: Exploring Parental concerns about Children's safety and the changing Nature of Childhood." Geoforum 28:219-235.

As a result, children are encouraged to participate in regulated play environments in homes or commercial "play and recreation"[47].

Recent initiatives to increase physical activity have often focussed on organised sport rather than free play outdoors. In his book *Last Child in the Woods*[48], Richard Louv spoke to a school teacher wanting to recreate the childhood he remembers and wants for his children:

"We tell our kids that traditional forms of outdoor play are against the rules, then we get on their backs when they sit in front of the TV – and then we tell them to go outside and play. But where? How? Join another organised sport? Some kids don't want to be organised all the time. They want to let their imaginations run; they want to see where a stream of water takes them."

As children are gradually separated from nature they will understand it less. A study from the University of Cambridge[49] in 2002 compared knowledge of Pokemon card characters with British wildlife (pictures of badgers, beetles, oak trees etc). The study found that 53% of 8 yr olds were successful in identifying wildlife, but more children (78%) were able to identify Pokemon characters. The fact that children's knowledge of fictional species is greater than natural species shows a huge capacity for learning in children but the failure to offer children education about their own natural surroundings.

Many people interviewed in a study for English Nature[50] (now Natural England) felt that contemporary children are over-managed and are prevented or distracted from experiencing the natural environment and outdoor play by a variety of factors, including:

- Complex toys stifle imagination and discovery of the outdoors

[47] Hasluck l and Malone K (1999) "Location, Leisure and lifestyle: Young People's Retreat to Home Environments." In Shehan, C ed. Through the eyes of the Child. Connecticut: Jai Press.
[48] Louv R (2005) Last Child in the Woods: Saving our children from Nature-deficit Disorder: Algonquin Books of Chapel Hill New York.
[49] Balmford A, Clegg L, Coulson T and Taylor J; (2002) Why conservationists should heed Pokemon Science 295 (5564) 2367b.
[50] Bell S et al (2004) Nature for people: The importance of Green Spaces to East Midlands Communities: English Nature Research reports Number 567. Jan 2004

- Image that outdoor activities are not 'cool'.
- Lack of encouragement of parents and institutions
- Fear on behalf of parents.

It identified parental opinions:

"I don't think that they are allowed to. I don't think that a lot of children are allowed to go and explore and be back at a certain time. I mean I used to roam the fields and woodlands and nobody ever thought anything about it, whereas today a lot of parents would say 'well you can't go down there because you might be attacked."

"I think of the people of our age group, our parents used to walk with us. My father walked with me from a very small age out the back lanes and into the woods, showing me where jays nested, where badger sets were, and telling me what the plants were. I didn't look at it as an education."

The report found that many schools didn't organise nature trips or education into natural history. They felt there was a latent demand for nature education. Rather than blame the school, most people blame the emphasis on performance statistics and a restrictive curriculum that prevents 'learning for learning's sake' and in which subjects such as nature get squeezed out.

Far from increasing their local world children are now more restricted in choice of places to play than at any time. Children would like to be outdoors. A nationwide survey of nearly 50,000 children found that 31% would prefer to cycle to school but only 3% were able to do so[51]. In the US the radius in which 9 yr old children were allowed to play in 1990 had shrunk by nearly 90% compared to 1970[52].

[51] Worpole K (2003) No particular Place to go? Children, Young People and Public Space. Groundwork.
[52] Gaster S (1991) "urban childrens baccess to their neighbourhoods:Changes over 3 generations" Environment and Behaviour 1991:70-85.

Nature and Teenagers

Children's relationship with nature changes as they go through teenage years. Many studies throughout the world have been consistent in showing that between the ages of 13 and 17 yrs there is a reduction in affinity for a natural environment[53]. Many teenagers state their own home or green area such as a developed park, sports field or friend's back yard as their preferred area to "hang out". There is also a much higher affinity with commercial areas including shopping centres, the main reason being that they are able to go with others there or because others are there already[54].

Teenagers favour places where they can be with their peers and activities that convey excitement and action. If natural settings support these inclinations they are preferred. In other studies across the world the importance of the environment to teenagers is in supporting a sense of self-identity and independence[55]. They describe the outdoor and public places they prefer in terms of their social characteristics (hanging out with friends without disturbance), and describe what they don't like in terms of physical attributes (dirty, uncared for, litter etc).

In a large international study Growing up in Cities (GUIC)[56] features regarded by teenagers as important were found to be remarkably consistent:

- A feeling of social integration and acceptance.
- Varied, interesting activity settings: Peer gathering places.
- A general sense of safety and freedom of movement.
- A cohesive community identity.
- Where available green areas for informal play and exploration and organised sports.

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[53] Kaplan R and Kaplan S (2002) Chapter 4: Adolescents and the Natural Environment: a time out? Children and Nature The MIT press.
[54] Owens PE (1994) Teen places in Sunshine, Australia: Then and Now. Children's Environments. 11(4), 292-299.
[55] Bell S, Thompson CW and Travlou P (2003) Contested views of freedom and control: Children, Teenagers and Urban Fringe Woodlands in Central Scotland: Urban Forestry and Urban Greening 2(2), 87-100.
[56] Chawla L (2002) growing up in an urbanised world. London, UNESCO.

There were also features that children associate with alienation and dissatisfaction:

- Social exclusion and stigma.
- Boredom.
- Fear of Crime or Harassment.
- Heavy traffic.
- Uncollected rubbish litter.

Physical characteristics are important if they increase social opportunities or if they provide challenges of physical skills (eg. off road biking or building dens). This "time out from a natural environment during the teenage years can be explained by either culture or evolution. It is believed that culture is unlikely to be the main influence, since in all cultures from different parts of the world there appears to be an immediate return to the affinity for nature at the age of 19yrs when self autonomy is unlikely to have been achieved particularly in "the West". The Kaplans therefore feel that there is an evolutionary reason that cannot be fully explained[57].

IN SUMMARY

Teenage years are a time when children develop an identity of their own. During this time there appears to be a reduced affinity with nature in preference to time with their peers. Nature can be used to increase social opportunities and provide the location for adventure activities for teenagers. However, teenagers are keen to see a clean, safe and green environment that can create a sense of identity. Research has found that there is a return to a relationship with nature from the age of 19yrs, so this reduced affinity is a brief interlude in a lifelong relationship.

[57] Kaplan R and Kaplan S (2002) Chapter 4: Adolescents and the Natural Environment: a time out? Children and Nature The MIT press.

Why is Childhood Experience of Nature Important?

The effect on adult experience

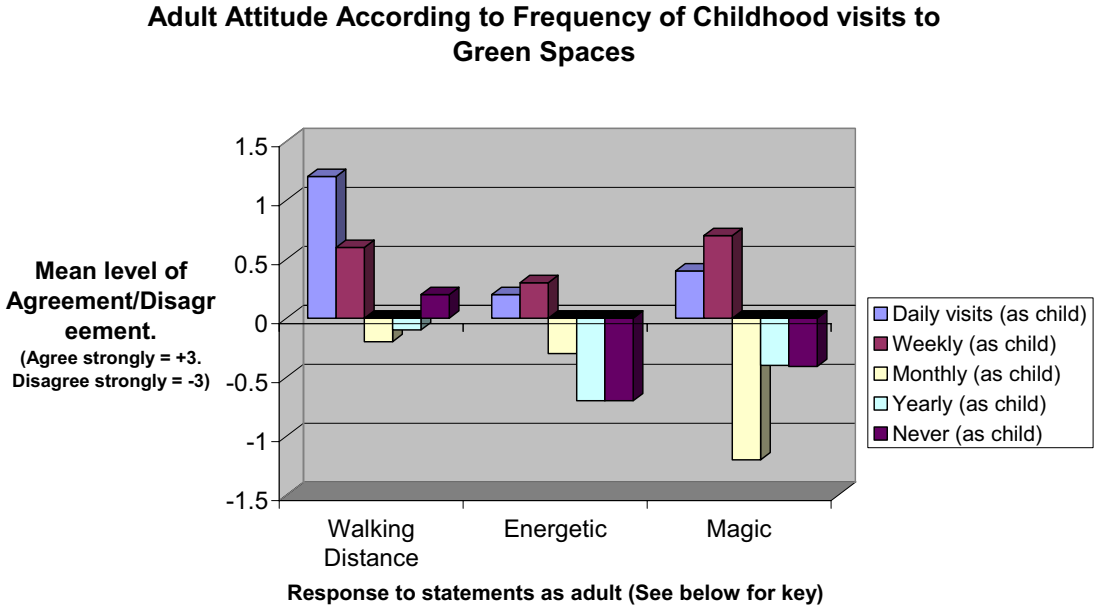
Adults who had childhood experiences of nature tend to prefer to visit places that remind them of those in childhood. A Scottish study[58] found that those who visited woodlands frequently as a child are more likely to visit woodlands or walk on their own. In fact, this correlation was the best predictor to how adults behave.

Those who thought of green spaces as magical places were also those who stated that they visited such places frequently as children, while those who did not visit green spaces as children strongly disagreed (Figure 7).

This has implications for the current generation of children who don't have direct experience with nature and who may now never know it as 'special' or even 'normal', but may perceive it as something they cannot understand or get to know.

[58] Bell S, Thompson CW and Travlou P (2003) Contested views of freedom and control: Children, Teenagers and urban fringe woodlands in central Scotland. Urban Forestry And Urban Greening, Vol 2 (2): 87-100.

Figure 7. Attitudes to green spaces according to the frequency of visits in childhood: English East Midlands. The more frequently the adult visited a green space as a child, the greater the number of visits and the benefit associated with green space as an adult[59]. Response to statements:
Walking Distance: I visit green spaces within walking distance of home.
Energetic: When in green spaces I feel more energetic.
Magic: I think green spaces can be magical places.



"I don't have any fears that there's something out there that is gonna get me or that I'm gonna fall over in the forest or that tree's gonna bite me." (Polly, aged 21yrs)

Young adults who had very little parental anxiety as children were most relaxed in woodland. However, those who had to play in sight of adults or only visited woods accompanied by adults had mixed feelings about woodland. The sense of freedom gained through this kind of early experience of unstructured play can be seen as a source of independence and inner strength which can be drawn upon in subsequent

[59] Simon Bell et al (2004) Nature for people: The importance of Green Spaces to East Midlands Communities: English Nature Research reports Number 567. Jan 2004

challenging and stressful situations. Parental anxieties have been shown to dilute the important experiences of independence in childhood[60].

Negative images of woodland presented by the media, films, myths and stories that play on the imagination, can also prevent teenagers from visiting. These too can be encouraged by parental anxiety:
"Like you see all these things on the news like people getting buried out in the woods and stuff, and like that's quite scary".(Ruth, aged 17yrs)

Can experience of nature as a child influence the environmental beliefs of a teenager or an adult? Bixler et al. interviewed 1800 adolescences and found that those who had played in the wilderness as younger children had more positive perceptions of natural environment, outdoor recreation activities and future outdoor occupational environments[61].

Another study examined the relation between outdoor experience in early life and environmental attitudes in early adulthood. It found that time outdoors appreciating nature, hunting and fishing, and exposure to books and nature programmes during youth were predictive of later positive environmental beliefs[62]. Immigrant children in the US who as young children foraged for berries, fish, acorns etc had a much deeper understanding of biodiversity as teenagers than their suburban middle-class counterparts[63].

German adults, some belonging to environmental organisations and some with no specific interest in the environment, were interviewed about their contact with nature as a child. The results showed that time spent in nature between the ages of 7 and 12yrs was associated with the adult feeling of "indignation about insufficient nature

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[60] Aitken SC (1994) Putting Children in their Place (Association of American Geographers: Washington DC.
[61] Bixler RD, Floyd MF and Hammitt WE (2002) Environmental Socialization: Quantitative Tests of the Childhood Play Hypothesis. Environment and Behavior 34 No6 November 2002, 759-818.
[62] Ewert A, Place G and Sibthorp J (2005) "Early-life outdoor experiences and an individuals Environmental attitudes. Leisure Sciences 27:225-239.
[63] Chipeniuk R (1995) Childhood Foraging as a means of acquiring Competent Human Cognition about Biodiversity" Environment and Behavior 27(4): 490-512.

protection"[64]. A similar study looking at the relationship between childhood contact with nature and adult's attitudes towards plants indicated that children who looked after plants and planted trees were most likely as adults to believe that "trees are calming" and "trees have personal meaning"[65].

A recent study looked at this relationship by interviewing 2,000 adults in the US. The results are consistent with the other research, demonstrating that contact with nature (particularly wild nature) before the age of 11yrs predicted a lifelong positive environmental behaviour. However, in common with some other research, it found that environmental education at school was not a significant factor in developing life-long positive environmental behaviour[66].

Peter Kahn describes this as "Environmental Generational Amnesia" [67] in which each new generation uses their experience of nature as a child as a benchmark against which they measure environmental degradation in the future. As less children connect with nature the benchmark is set low so that there is an indifference to loss of natural environment in the future. Pyle calls this the "extinction of experience".[68] With 80% of the population in the UK living in towns and cities[69], there is a distinct possibility that the next generation will have a reduced value the natural environment and so its vulnerability to development is increased.

IN SUMMARY

Adults' attitude to the environment and time spent in green space is strongly influenced by their experience as a child. Children who spend time in woodland with friends or

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64 Kals E, Schumacher D and Montada L (1999) Emotional Affinity toward nature as a motivational Basis to Protect Nature" Environment and Behavior 31: 178-202.
65 Lohr VI and Pearson-Mims CH (2005) Childrens Active and Passive Interactions with plants Influence. Their attitudes and actions toward trees and gardening as adults" Hort Technology 15(3): 472-476.
66 Wells NM and Lekies KS (2006) Nature and the life course: Pathways from adulthood Nature Experiences to adult Environmentalism. Children, youth and environments 16(1).
67 Kahn PH Jr and Friedman B (1995) Environmental views and values of children in an inner city black community. Child Dev.66 1403-1417.
68 Pyle RM (1978) The extinction of experience. Horticulture 56,64-67.
69 Office of National Statistics, 2001 Census.

alone without parental supervision are the most likely to visit and enjoy woodland as an adult. These adults are also more likely to describe woodland as "magical" and are less anxious when visiting woodland alone. Children with anxious parents, or those who never visited woodland or had always been accompanied by an adult, were the least likely to use or enjoy nature later in life. The critical age of influence appears to be before 12yrs. Before this age contact with nature in all its forms, but in particular wild nature, appears to strongly influence a positive behaviour towards the environment. The sense of freedom of unstructured play that occurs in nature creates a source of independence and inner strength that can be drawn upon during stressful situations for the rest of their life.

Some researchers describe the lack of connection between children and the natural environment as an "extinction of experience" meaning that these children will grow up with a poor understanding of nature and consequently a reduced value for nature. There is a positive link between contact with nature as a child and environmental work as an adult.

The Effect Nature Has on Children's Self-Discipline.

Self-discipline and concentration "direct attention" are operated by the same area of the brain. The theory put forward by Stephen Kaplan (see 'Attention Restoration Theory') that contact with nature can restore the brain after a period of hard concentration or "direct attention" should in theory also have an effect on the concentration levels of children. Several studies have shown consistent results that would support this theory.

In a small study, Wells[70] followed up 17 children who had been moved from substandard accommodation to new apartments by the local council in the US. The new apartments were randomly allocated. Each child was assessed for inattention and hyperactivity before and after the move. Each apartment was assessed for the amount of nature viewed from the window. The results showed that the amount of nature accounted for 19% of the improvement of the attention score compared to only 4% that could be attributed to improved housing quality.

Other work by Grahn[71] in Sweden demonstrated that kindergartens where children are able to play in a natural environment, have less illness and better physical ability among children than in a kindergarten where children play in an ordinary playground.

In a much larger study involving 169 children[72] the aim was to discover if nature could improve negative characteristics. In Chicago, there is a large complex of 28, 16-storey buildings with 12,000 residents, of whom 99.7% are African-American and 75% receiving aid. Nature was measured from the windows of each flat, and 'concentration', 'impulsive behaviour' and 'delay of gratification' were measured using validated tasks and questionnaires. All these factors have a direct relationship with academic achievement, vandalism and violence, and even teenage pregnancies.

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[70] NM Wells (2000) At Home with Nature. Effects of Greeness on Children's cognitive functioning. Environment and Behaviour Vol 32 No6 Nov 2000 775-795.
[71] Grahn, P., Mårtensson F, Lindblad B, Nilsson P and Ekmann A (1977) ute på dagis. Stad och Land No145 Hassleholm, Sweden: Norra Skåne Offset.
[72] Taylor AF, Kuo FE and Sullivan WC (2001) Views of nature and self-discipline: evidence from inner city children JEVP 21 Suppl.

In girls, all three aspects of self discipline showed a positive and significant relationship with the greenness of the immediate vicinity and the view from the flat. When put together the greenness of the area accounted for 20% of the variation. The reason that boys are not significantly affected may be that they spend less time around the home. This is supported by other studies that have used geographical mapping of children's play[73].

Another study looked at participants who undertook a nature walk, and an urban walk or passive relaxation. Each group undertook 40 minutes of intense and tiring mental concentration. Those who went on the nature walk were significantly better at performing proof reading tasks after the walk compared to the urban walk or just relaxing. Likewise, children who returned from a backpacking holiday in a natural environment did significantly better on a proof reading test compared to those who had a holiday in an urban environment or no holiday at all[74].

IN SUMMARY

Children's ability to concentrate and be more self-disciplined has been associated with contact to nearby nature. Girls in particular are more likely to benefit if they live in an urban area with views of trees and grass, even when controlled for social class and income. Juvenile crime, poor school achievement and teenage pregnancies are associated with low levels of self-discipline, impulsive behaviour, immediate gratification and inattention, which in one study have all been shown to improve through contact with nature. Increasing the amount of accessible and natural environment should be considered as a way of improving overall performance and ability in inner-city children.

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[73] Hart R (1993) Children's Experience of place. New York: Irvington Publishers, [inc: Sobel (1979) Children's special places: Exploring the role of forts, dens and bush houses in middle childhood. Tucson AZ: Zephyr].

[74] Hartig T, Mang M and Evans GW (1991). Restorative effects of natural environment experiences. Environment and Behaviour, 23, 3-26.

Children's Play and Nature

Play is the work of children. All children have a right to play. This was ordained in Article 31 of the United Nations Convention on the Rights of the Child (1989). Play is not only valuable as an enjoyable activity; it is the way for children to learn. Play helps children to solve problems and promotes creative thought. Symbolic play contributes to communication, cooperation, interpersonal problem solving, creativity, personal responsibility and imagination.

In their review of the subject Karen Malone and Paul Tranter[75] look at different aspects of play and how nature is important for children to develop properly through play. The type of place where children play directly affects the quality of play[76]. Play is a means by which children learn without being taught. It involves doing, exploring, discovering, failing and succeeding.

The more complex and varied the area of play the more children will prefer it[77]. A play area that can be changed and modified provides more opportunities for environmental learning, with corresponding behavioural consequences[78].

In the research summary Best Play[79], the benefits of play are divided into two parts.

Benefits that are experienced at the time that the child is playing:

Play:

- Provides children with opportunities to enjoy freedom, and exercise choice and control over their actions

[75] Malone K and Tranter P (2003) Children's Environmental Learning and the use, design and Management of Schoolgrounds. Children, Youth and Environments Vol 13, No 2.
[76] Moore RC, Goltsman SM and Iacofano DS (1992), Play for all guidelines: Planning, design and management of outdoor play settings for all children. Berkley:MIG Communications.
[77] Fjortoft I and Sageie J (2000) The Natural Environment as a Playground for Children: Landscape Description and Analyses of a Natural Landscape. Landscape and Urban Planning 48(1/2):83-97.
[78] Moore R and Wong H (1997) Natural Learning. In Creating Environments for Rediscovering Nature's Way of Teaching. Berkley: MIG Communications.
[79] National Playing Felds Association (2000) Best Play: What play provision should do for children.

- Offers children opportunities for testing boundaries and exploring risk.
- Offers a very wide range of physical, social and intellectual experiences for children.

Benefits that develop over time

Play:

- Fosters children's independence and self esteem
- Develops children's respect for others and offers opportunities for social interaction
- Supports the child's well-being, healthy growth and development
- Increases children's knowledge and understanding
- Promotes children's creativity and capacity to learn.

A lack of opportunity for play can have the following detrimental effects:

- Poorer ability in motor tasks
- Lower levels of physical activity
- Poorer ability to deal with stressful or traumatic situations and events
- Poorer ability to assess and manage risk
- Poorer social skills, leading to difficulties in negotiating social situations such as dealing with conflict and cultural difference.

The Value to Children of Playing in a Natural Setting

"Play Naturally"[80], a review of natural play commissioned by the Children's Play Council is an excellent review of the benefits to children of playing in nature. Its summary states:

[80] Lester S, Maudsley M. (2006) Play Naturally: A Review of Children's Natural Play. Commissioned by the Children's Play Council

1. Playing in natural spaces offers possibilities for: Control and mastery, construction of special spaces, manipulating loose parts, different ways of moving, risk taking etc. Childhood experiences of playing with nature also instil a sense of wonder, stimulating creativity, imagination and symbolic play.
2. Playing in natural spaces supports a child's sense of self, allowing children to recognise their independence alongside an interdependence and connectedness with their ecological worlds.
3. The powerful combination of a diversity of play experiences and direct contact with nature has direct benefits for children's physical, mental and emotional health. Free play opportunities in natural settings offer possibilities for restoration, and hence, well-being.

Children have a particular attraction to natural environments. Numerous studies have found that children often prefer to play in natural or wild spaces[81]. Such spaces appeal to children because of their diversity and their feeling of timelessness[82]. Children's access to nature provides an important aspect of growing up, with many adults remembering natural or outdoor environments as the most significant places in their childhood[83].

Several studies have found that playing in nature has positive impacts on "children's social play, concentration and motor ability"[84]. A study in Sweden compared two nurseries. One had a playground area surrounded by tall buildings with low plants and a cycle path, the second had a mature orchard and some woodland. In this natural play area the children played outside every day in all weathers. The results showed that this group of children had better motor co-ordination and attentional concentration

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[81] Maxey I (1999) Playgrounds: From oppressive spaces to sustainable Places? Built Environment 25(1):18-24.
Cunningham, Jones CM and Taylor N (1994) The child-friendly Neighbourhood: Some questions and tentative answers from Australian Research. International Play Journal 279-295.
[82] White R and Stoecklin V (1998) Children's outdoor play and learning Environments Returning to Nature. Whitehutchinson.com: Children/articles/outdoors.html
[83] Sebba R (1991). The landscapes of childhood: The reflection of childhood's Environment in adult memories and in children's attitudes. Environment and Behaviour 23 (4) 395-422.
[84] Fjortoft I and Sageie J (2000) The natural environment as a Playground for children: Landscape Description and Analyses of a natural Landscape. Landscape and Urban Planning 48 1/2: 83-97.

abilities[85]. Natural environments have advantages over purpose built playgrounds (with climbing apparatus, for example) because they stimulate more diverse and creative play[86]. According to the National Environmental Education and Training Foundation in the US, when schools make a concerted effort to integrate natural environments into their education (using local areas or their own school grounds) academic performance improves across the curriculum[87].

The ways in which children relate to each other can also be strongly influenced by the types of natural elements in play environments. A US study[88], noted that when children played in a man-made environment dominated by play structures they established a social hierarchy by means of physical competence. The tough and physical children took the lead. However, after an open grassy area was planted with shrubs, children played very differently in these "vegetative spaces." Fantasy play and socialisation developed. More importantly, the social hierarchy became based less on physical prowess and more on a "child's command of language and their creativity and inventiveness in imagining what the space might be… Children who were dominant in the equipment-based play yard were not always the dominant children in the yards with the new plantings."

This is supported in a study that looked at the design of playgrounds and associated play[89]. The most bullying occurred in plain tarmac play areas, particularly where space was limited. The school with the least bullying was a Steiner school where children were encouraged to relate to nature and playtime was an extension of learning and exploration in a natural environment, often resulting in the children getting dirty. This highly interactive and engaging environment was thought to help reduce bullying and led the authors to conclude along with others working in this field that:

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85 Grahn P, Martensson, F, Lindblad B, Nilsson P and Elkman A (1997) Outdoors at Daycare. City and Country, No 145 Hassleholm, Sweden Norra Skane Offset. (In Swedish).
86 Fjortoft I and Sageie J (2000) The natural environment as a Playground for children: Landscape Description and Analyses of a natural Landscape. Landscape and Urban Planning 48 1/2: 83-97.
87 Environment – based Education: Creating High Performance Schools and Students. Washington, DC: The National Environmental Education and Training Foundation (2000).
88 Herrington S and Studtmann K (1998) Landscape Interventions New Directions for the Design of Children's Outdoor Play Environments: Landscape and Urban Planning 42(2-4): 191-205.
89 Malone K, Tranter P, (2003) Children's Environmental Learning and the use, design and management of school grounds. Children Youth and Environments 13(2).

"*The obvious way to reduce aggressive behaviour and conflict on school grounds is to provide sufficient play activities with differing levels of complexity and variety that engage students and provide opportunities for cross-age interaction*" [90].

It was also observed that children in other schools were often trying to regain contact with nature but were prevented by teachers because of the teacher's concerns about health and safety (climbing trees), or getting dirty (playing in puddles/water), or to prevent degradation of school grounds (causing damage). In his review in Canada, Lambert[91] states that:

"*Destructive behaviour is sometimes encouraged by…large, boring, open play areas, where space is not broken up by trees, low bushes, hedges or other natural boundaries…environments like this, which often incorporate little or no natural shade, make it impossible for small peer groups to get away from each other.*"

A study in a poor housing complex in Chicago looked at the difference in play between areas with trees and areas that were predominantly barren[92]. The effect of vegetation was significant for the number of children playing and the type of creative play (see figures 8 - 10). One possible criticism is that green space attracts more children whether playing or not playing. However, the non-playing numbers were significantly lower, demonstrating that vegetation actually increases play.

The study also demonstrated that children had double the access to adults in areas where higher levels of vegetation are present. This is important since it is through interaction with adults and adult supervision that children learn the values and appropriate interpersonal skills of their community[93]. In fact: "*lack of parental*

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90 Brett A, Moore R and Provenzo E (1993) The complete Playground Book. New York: Syracuse University Press.
Evans J (1995) Conflict and control in the school Playground. Changing Education 2(1/2):17,22,24.
91 Lambert EB (1999) Do school Playgrounds Trigger Playground Bullying. Canadian Children 24(1): 25-31.
92 Taylor AB, Wiley A, Kuo FE and Sullivan WC (1998) Growing up in the Inner City. Green places to grow. Environment and Behaviour 30 No1 P3-27.
93 Miller PJ and Sperry LL (1987). The socialization of anger and aggression. Merrill-Palmer Quarterly, 33(1), 1-31.

supervision is one of the strongest predictors of the development of conduct problems and delinquency" [94].

Figure 8. Average number of children participating in play and non-play activities in each of the 64 low and high-vegetation spaces.

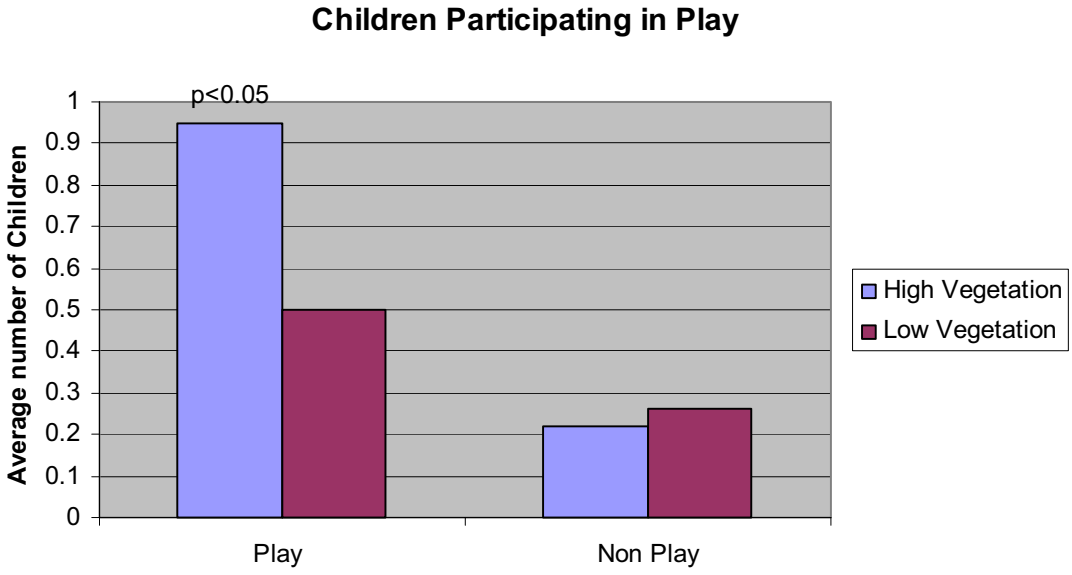
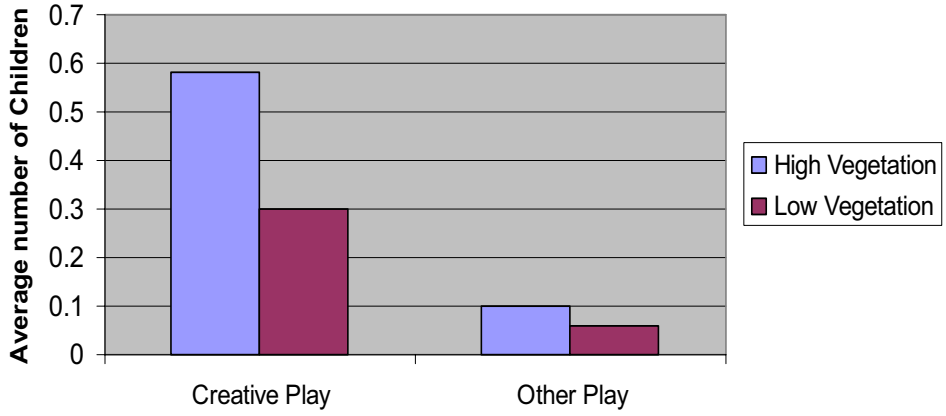
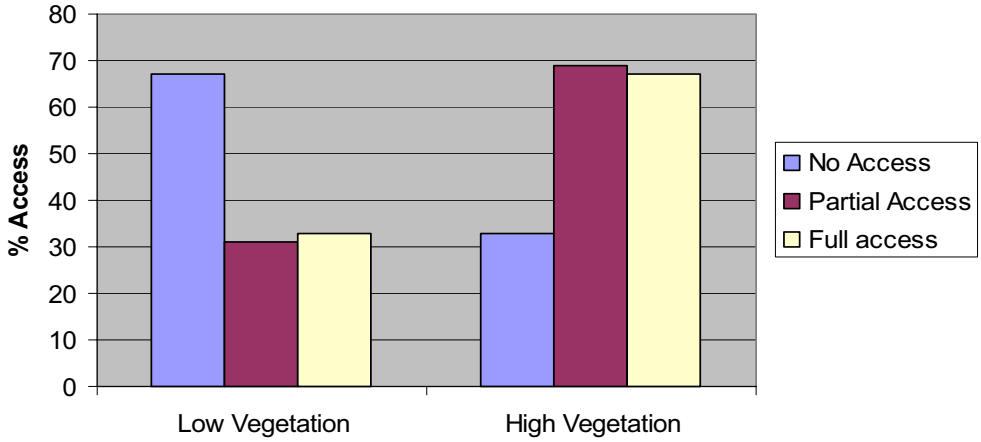


Figure 9. Average number of children participating in creative play and other play activities in each of the 64 low and high-vegetation spaces. (These observations were made during short periods after school or at weekends in and the average was taken for each period)



[94] APA Commission on Violence and Youth (1983) p19.

Figure 10. Percentage of children with access to adult figures in low- and high-vegetation spaces.



For children to develop a sense of place, direct contact with the natural aspects of their environment, including vegetation, soils, people and animals is beneficial[95]. However, if they lose their access to their environment they are deprived of the chance to develop this sense of place[96]. The impact of rapid urbanisation means that children in many cities throughout the world now have less access to natural or wild environments, especially on their own[97] [98]. Many people will remember a play area as a child that was not owned or developed by anyone else –in the US this is termed a vacant lot. These natural outdoor spaces are vanishing, there is increasing fear of violence in public spaces, parents have busy schedules and many play areas are now synthetic rather than natural[99].

[95] Orr D (1992) Ecological Literacy: Education and the Transition to a post modern world. New York: State University of New York Press.
[96] Tranter P and Pawson E (2001) Children's Access to local Environments: a case study of Christchurch, New Zealand. Local Environment 6(1): 27-48.
[97] Cunningham Jones CM and Taylor N (1994) The child-friendly Neighbourhood: Some questions and tentative answers from Australian Research. International Play Journal 279-295.
[98] Freeman C (1995) The Changing Nature of Children's Environmental Experience: The Shrinking Realm of Outdoor Play. Environmental Education and Information 14(3):259-280.
[99] Herrington S and Studtmann K (1998) Landscape Interventions New Directions for the Design of Children's Outdoor Play Environments: Landscape and Urban Planning 42(2-4): 191-205.

Even local parks have restrictions on children's scope to play with nature. According to a study interviewing 500 children:[100]

- 45% said they were not allowed to play with water
- 36% could not climb trees
- 27% were not allowed to play on climbing equipment
- 23% were not allowed to ride bikes or play on skateboards.

A survey by CABE also found that 2/3 of mothers would not allow their children to play in the park unsupervised. There is a need for a complete review of how we reconnect children with nature again and allow them to explore play and understand the relationship between humans and nature. If we do not, we face the extinction of experience, as described by Pyle[101], in which the benefits of our natural environment are lost on each generation until they are completely absent from future generations' lives. [Resilient children are] the keepers of the dream – our best hope for learning how to use the lessons of the past to help ourselves in the future.

[100] Worpole K (2003) No particular place to Go. Groundwork Trust.
[101] Pyle RM (2002) Eden in a vacant lot: Special places, species and Kids in the neighbourhood of life. In Children and Nature: Psychological, sociocultural and evolutionary Investigations (Kahn P.H Jr. and Kellert SR eds). p305-327, MIT press.

IN SUMMARY

Play is an essential part of normal childhood development. Children have to play in order to develop normally. Play develops a child's co-ordination, strength and social skills, and helps them to develop a relationship with their environment. Children prefer natural environments to play in as these help develop all types of play, including more imaginative forms of play. In contrast to man-made environments, a natural setting can prevent the dominance of a hierarchy based on physical strength, since it leads to more imaginative play. There is some evidence that a natural setting can reduce bullying. Bullying is increased by boredom and overcrowding in a playground. Vegetation and other natural features can create enclosed areas to help different groups play together and create varied activities suitable for different age groups, leading to better overall concentration and motor skills.

Mental Health in Children in the UK

The National Institute for Mental Health in England published a strategy called "Making it Possible: Improving Mental Health and Well-being". In the foreword, the National Director for Mental Health, Professor Louis Appleby states:

"*in many ways though, mental health promotion underpins the successful delivery of the whole of the NSF [National Service Framework for mental health]… …we need to broaden our focus from specialist mental health services to the mental health needs of the community as a whole*"

To reduce the high rates of mental health disorders, it wants to provide parents and caregivers with the knowledge, skills and capacity to meet the emotional and social needs of infants and young children. Schools must meet targets to deliver the Social and Emotional Aspects of Learning (SEAL) to develop Children's social, emotional and behavioural skills. The strategy also concentrates on increasing opportunities for volunteering and recognises the importance of access to the natural world and local green space. There is an urgent need to improve children's sense of wellbeing: the UK is one of the worst in Europe with only the new accession states faring worse[102] and the NHS is not in a position to solve this problem on its own.

Overall Statistics

The Office of National Statistics[103], surveyed 10,500 5-15yr olds. In the 5-10yr age group 10% of boys and 6% of girls had some diagnosed mental health disorder. This rose to 13% of boys and 10% of girls in the 11-15yr old group. In addition 7% of 3 yr olds have moderate to severe behavioural problems with a further 15% having mild problems.

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[102] Bradshaw J (2006) An index of child wellbeing in the EU 25. Presentation to Medchild conference Rome, 2006.
[103] Office of National Statistics (2004) The Health of children and young people: Chapter 12, Mental Health.

There is a strong link between educational difficulties and psychiatric problems. 15% of children without a psychiatric disorder have special educational needs. This increases to half of those with conduct disorders (disruptive behaviour) and over 70% of those with hyperkinetic disorders (hyperactivity). The worrying consequence of childhood psychiatric illness is not just the general unhappiness this causes the child and family but also the long-term consequences. By age 28, the costs to society (e.g. crime, poor employment record, poor health, being on benefits, needing social services) for individuals with troubled behaviour as children are ten times higher than for those with no problems.

Children with ADHD and other behavioural problems are more likely to:

- Have poor educational achievement and drop out of school,
- Have poor early work history and be more likely to be unemployed,
- Leave homes and families at younger ages,
- Enter sexual relationships earlier with more breakdowns in relationships,
- Become pregnant, or father a child, earlier than their peers,
- Become involved in crime,
- Suffer poorer general health in their early adult years.

There is a strong risk associated with social class. Children in social class 5 families are 3 times more likely to have mental ill health. The highest risk is among those being looked after by local authorities, who are 5 times more likely than average to have a mental health disorder (42% vs. 8%). Young offenders have an 80% risk of mental health problems, and have 50 times the risk of psychosis (10%), compared to 0.2% in the overall population. 60% of homeless children have mental health problems, compared to 25% in a comparable (non-homeless group), and about 30% had attempted suicide, compared to 9% in the comparable group.

A survey of deliberate self-harm in adolescents in 2002[104], in which 6,020 young people aged 15 to 16 completed an anonymous questionnaire, showed that 6.9% had

[104] Hawton K, Rodham K, Evans E and Weatherall R (2002) 'Deliberate self-harm in adolescents: self report survey in schools in England', BMJ, vol 325, 1207-1211.

committed an act of self-harm in the previous year, and 12.6% of these episodes resulted in a visit to hospital. Self-harm was more common in girls than boys (11.2% compared to 3.2%). Factors associated with self-harm among girls include recent self-harm by friends and family members, drug misuse, depression, anxiety, impulsivity and low self-esteem. In boys it was associated with suicidal behaviour in friends and family members, drug use and low self-esteem.

Figure 11.

Prevalence of Psychiatric Disorders among boys aged 5 to 15 years 1999
(Great Britain) Source: Mental Health of Children and adolescents in Great Britain, 1999 ONS Survey

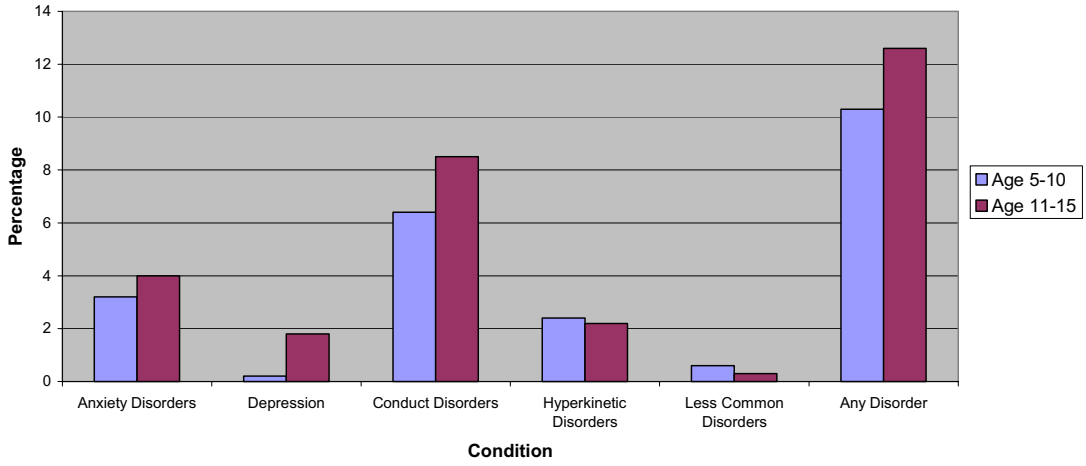


Figure 12.

Prevalence of Psychiatric Disorder among girls aged 5-15 years 1999. (Great Britain) Source Mental Health of Children and adolescents in Great Britain 1999 ONS Survey

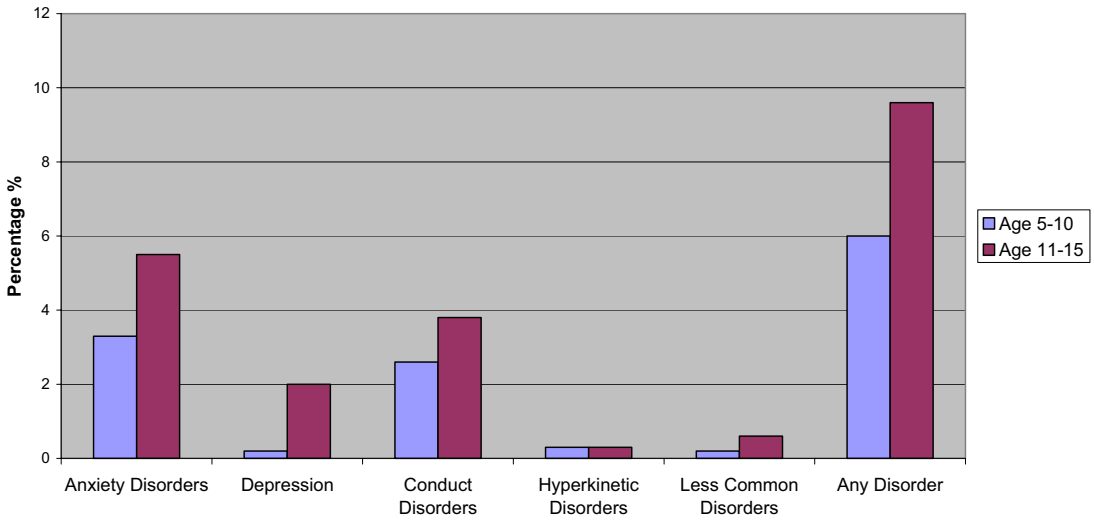
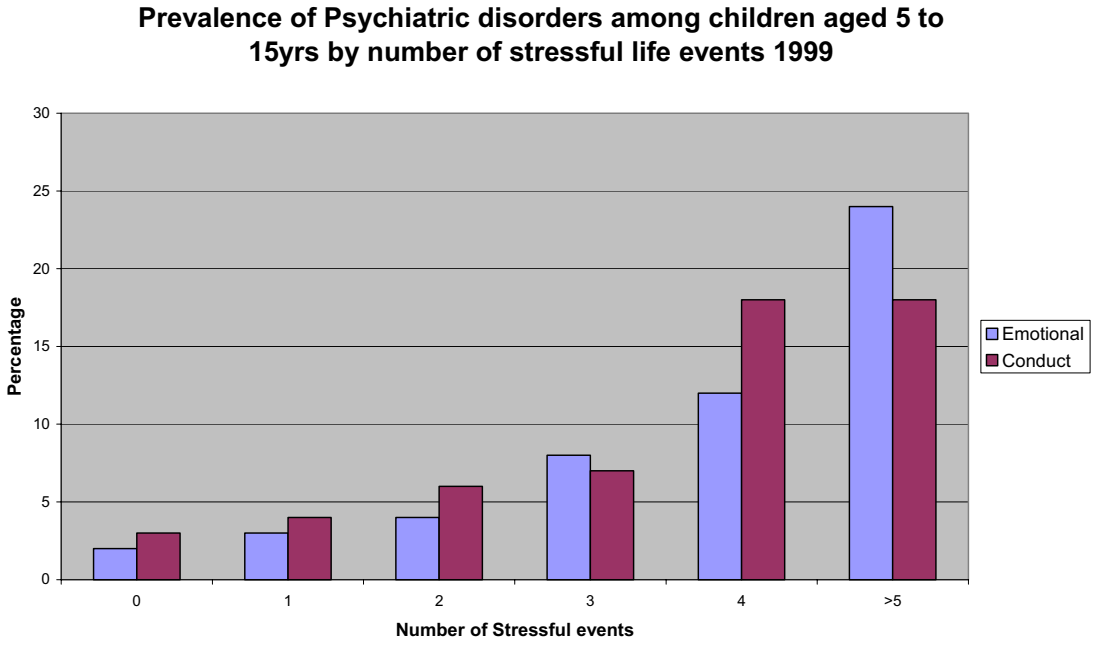


Figure 13.



IN SUMMARY

1 in 10 boys and 1 in 18 girls aged 5-10yrs have a diagnosed mental health disorder. Those children aged 11-17yrs have higher levels with 1 in 8 boys and 1 in 10 girls. The children at highest risk are those in a lower social class and young offenders. There is a steady increase in diagnosis of disorders and treatment using medication. More than 40,000 children now use anti-depressants, following a sharp rise over the past 5 years. In 2002, there were 29,400 female suicide attempts and 14,500 male suicide attempts in young people under the age of 25 yrs. A recent study has placed Britain 21st out of 25 European States for wellbeing in children. They have poorer relationships, engage in riskier behaviour and suffer from worse health than their European counterparts.

Attention Deficit Hyperactivity Disorder and Nature

Attention Deficit Hyperactivity Disorder (ADHD) is a common condition in children, affecting between 5-10% of 6-11yr olds[105]. There are three main problems for a child with ADHD, which lead to social problems[106]:

Overactive behaviour

The child is always active, unable to sit still, interfering with other children's activities, and may be seen as naughty or unwilling to learn.

Impulsive behaviour

Being impulsive means acting without thinking about the consequences. Children with ADHD may be impulsive in many ways, such as saying or doing the first thing that occurs to them. They are also easily distracted by irrelevant things. They will find it hard to do any activity which involves waiting to give an answer, or in which they have to take turns.

Difficulty in paying attention

Children with ADHD have a short attention span. They find it hard to concentrate and therefore hard to learn new skills, both academic and practical. Research from the USA suggests that 90% children with ADHD underachieve at school and 20% have reading difficulties.

Social problems

Children with severe ADHD may be rejected or disliked by other children, because they disrupt their play or damage their possessions. It is easy for a child with ADHD to

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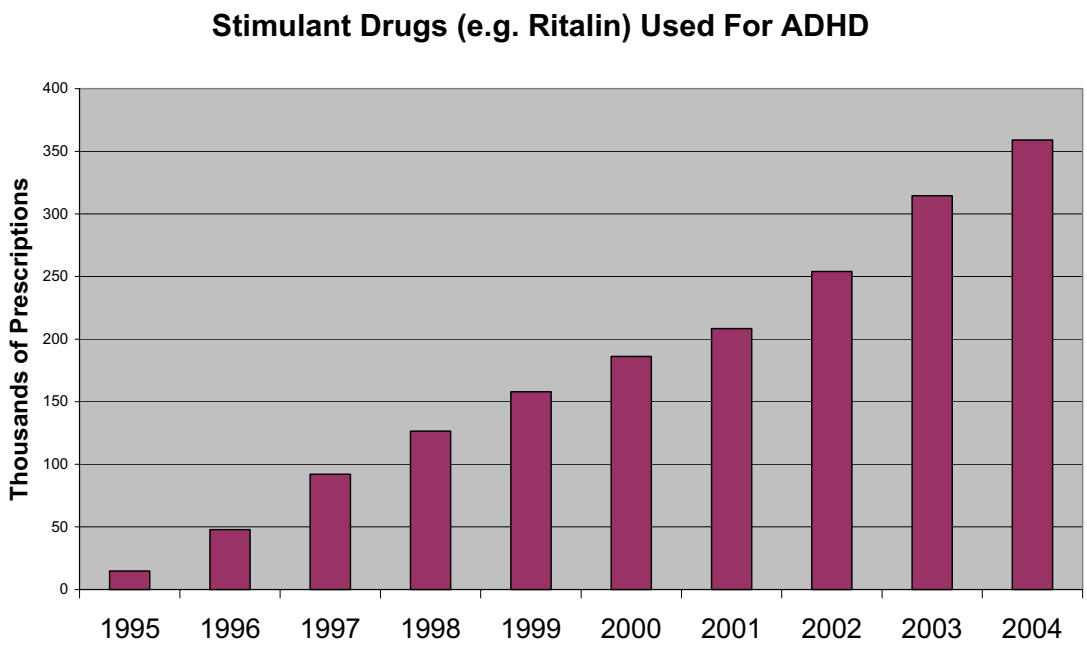
[105] Taylor E, Sandberg S, Thorley G and Giles S (1991) The Epidemiology of Childhood hyperactivity. Maudsley Monograph. London: Oxford University Press.
[106] Mental Health Foundation (2000) All about ADHD *http://www.mentalhealth.org.uk/page.cfm?pagecode=PBBFAD)*

become labelled as troublesome, or for parents to think it is their fault for not controlling their child.

The limited effectiveness of interventions and the consequence of drug addiction, criminal behaviour and antisocial behaviour being more common in adults with a history of ADHD, make it a considerable burden on society that extends beyond childhood.

Treatment may be in the form of family counselling, interventions at school and drugs such as stimulants (e.g. Ritalin) and tricyclic antidepressants. Despite the side effects, which include weight loss, insomnia and irritability, there has been a steady increase in use of stimulant drugs. See figure 14.

Figure 14. The number of prescriptions issued of stimulant drugs of which 90% will be for children with ADHD or similar behaviour problems in UK[107].



[107] Department of Health (2005) in reply to question in House of Commons, 6 June 2005, Hansard.

Can ADHD Symptoms Improve With Green Space and Nature?

Earlier in this report the "attention restoration" work of the Kaplans was discussed. Direct attention which involves blocking out distractions, is tiring. "Indirect attention" can be stimulated by green space, and helps to restore the mind and allow the brain to resume the more tiring direct attention.

The symptoms of ADHD are very similar to tiredness caused by a long episode of direct attention. In fact neuroscientists show that it is a similar part of the brain (right prefrontal cortex) is affected in both conditions[108] and that this area is subject to tiredness after sustained demands of direct attention[109]. Children with ADHD have a smaller and less active right frontal cortex compared to their normal peers[110]. The major difference is that ADHD persists whereas fatigue can be relieved.

If the natural environment is very good at restoring the mind when it is mentally fatigued, can the natural environment help those children with ADHD? Three studies have been carried out, all showing likelihood that this may be the case.

The first study[111] looked at parents reporting how their children's symptoms were after activities graded 'Green' (fishing, soccer, reading outside), 'Ambiguous' (Rollerblading, playing outside), and 'Not green' (Video games, TV). The study looked at ratings given by parents of symptoms which varied from a worst score of 2.14 (homework) to 3.8 (riding bike alone in green setting) 1.00 is much worse than average, to 5 that is much better than average. For those in green activities, 85% had better scores and only 15% worse symptom scores. The average scores are shown in figure 15 below. The difference between green outdoors and both indoors and built indoors is significant $p=<0.001$.

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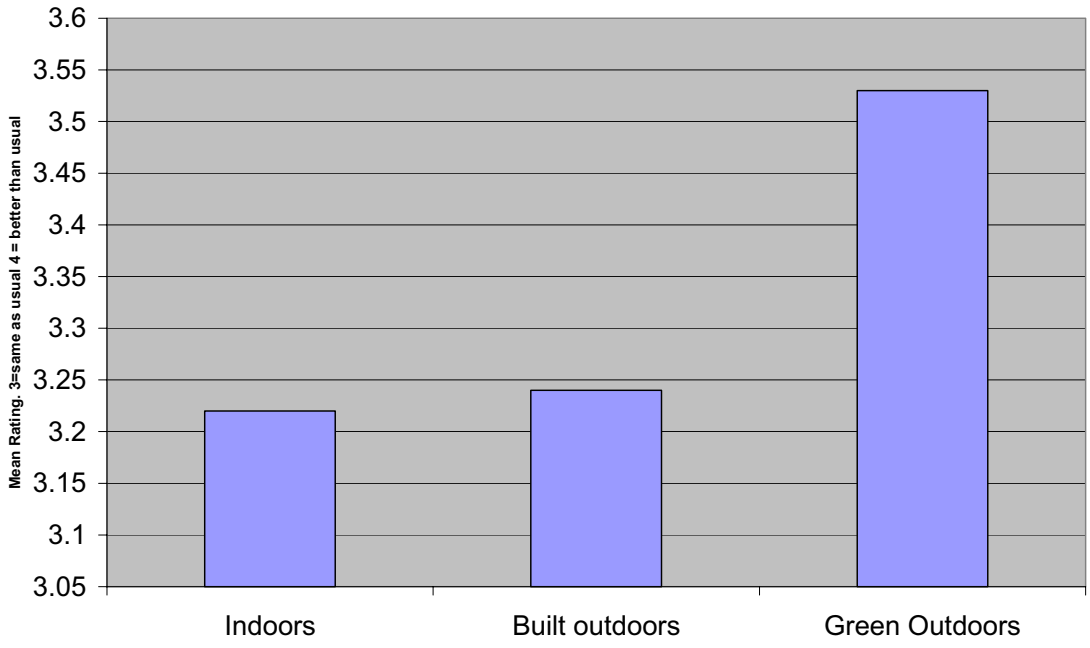
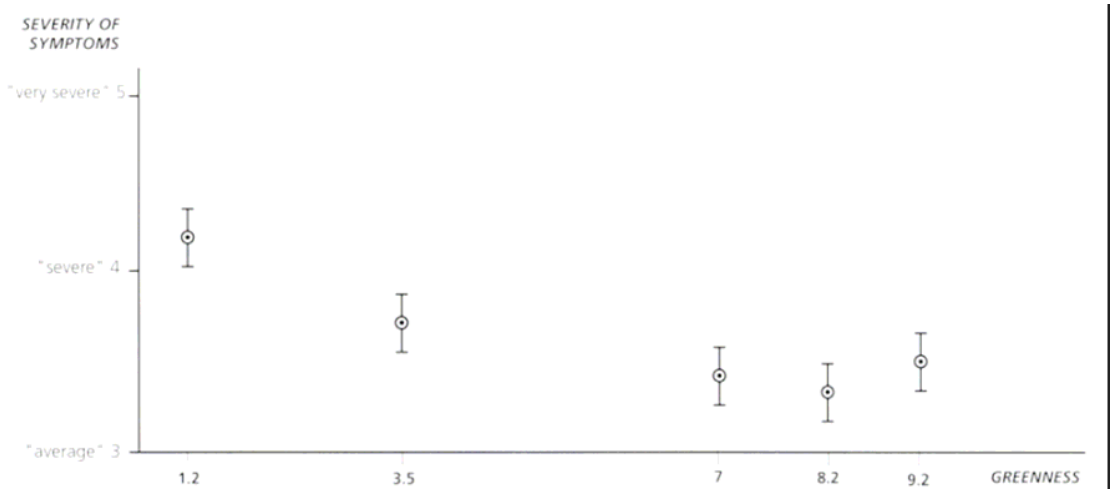
108 Coull JT, Frackowiak RSJ and Frith CD (1998) Monitoring for target objects: activation of right frontal and parietal cortices with increasing time on task. Neuropsychologia 36: 1325-1334.
109 Glosser G and Goodglass H (1990) Disorders in executive control functions among aphasic and other brain damaged patients. J Clin Exp Neuropsychol;12:485-501
110 Heilman KM, Voeller KK and Nadeau SE (1991) A possible pathophydsiologic substrate of ADHD: J Child Neurology; 6(Suppl):76-81.
111 Faber Taylor A, Kuo F, and Sullivan W (2001) Coping with ADD. The Surprising Connection to Green Play Setting. Environment and Behaviour. 33 Jan 2001 pp54-77.

Figure 15. ADHD symptoms after different activities (3.00 = the same as usual and 4.00 is better than average). [111]



Another hypothesis looked at whether current ADHD symptoms were influenced by the greenness of child's play the previous week. The greenness was assessed by the amount of grass and tree cover in which the child played, using a scale devised by horticulturists. This showed a significant decrease of symptoms when the child had been exposed to more green areas.

Figure 16. Mean severity of attention deficit symptoms for Five Play Settings comparing indoors with outdoor green areas. Greenness Key: 1.2= Indoors no windows: 3.5 Indoors with windows: 7 Open grass 8.2 Grass with trees: 9.2 Wild areas. (outdoors no green too few numbers) [111]



Of all the 346 parents who were asked their opinion as to what was important to help reduce symptoms, only two mentioned 'nature' as a possible reason. This means that there was little chance of parents having a preconceived idea and so being biased in their reporting.

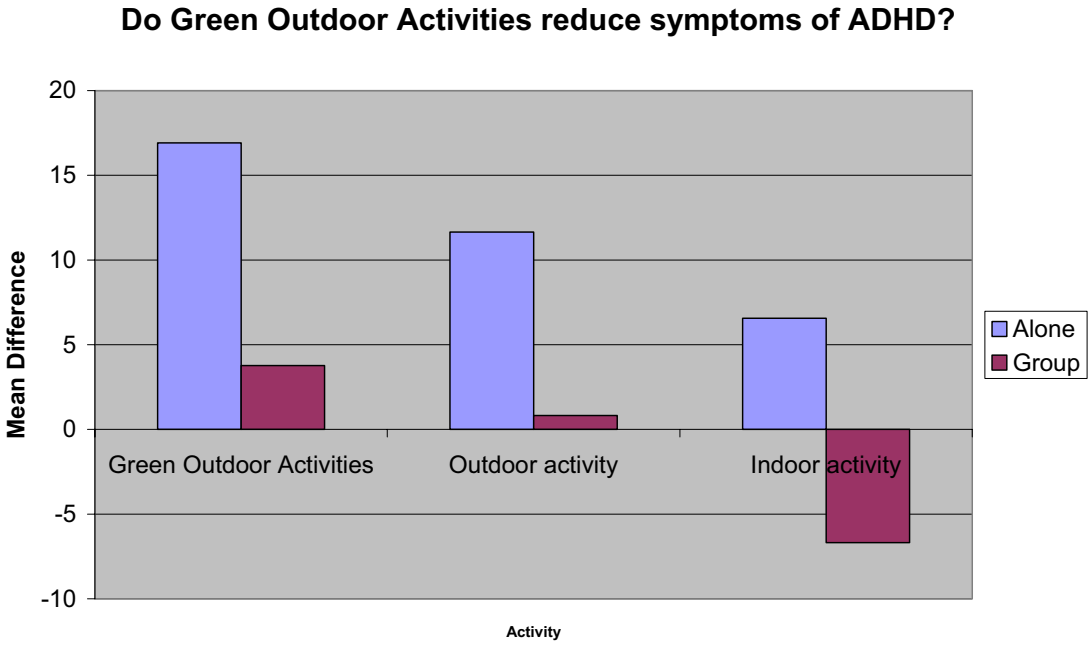
Further work involved children aged 7-12 yrs with ADHD taking part in three 20-minute walks, each in a different urban or natural setting. Before each walk they had to complete a puzzle to induce some attention fatigue. After the walk they were independently evaluated for measures of attention. Children performed significantly better after walking in the greenest setting than in the other two settings[112].

A larger study involving 406 ADHD children[113] showed a significant relationship between green space and better symptom control compared to either urban outdoors (mean difference 1.31 $p<0.0001$) or indoors (mean difference 3.43 $p<0.0001$), see figure 17. This was consistent regardless of age, sex, family income, severity of condition, and

[112] Kuo FE and Faber TA (2004) cited in American J Public Health **94**:9 1580-1586.
[113] Kuo FE and Faber TA (2004) A potential Natural Treatment for Attention-Deficit Hyperactivity disorder: Evidence from a national study. American J Public Health **94**:9 1580-1586.

whether from urban, suburban or rural homes. When differentiating group and individual participation, it showed that all three activities benefited symptoms when the child was alone, although green activities had a significantly greater effect. When the children were in groups, only green exercise benefited symptoms significantly. The effects of outdoor (non-green) were not significant and the indoor group activity made symptoms significantly worse.

Figure 17. 406 children with ADHD showing that symptoms based on a score -20 (the worst) to +20 (the best) were significantly better when children carried out activities when alone in all places of exercise. In groups children benefited only when outdoors undertaking green exercise and indoor exercises made symptoms significantly worse. [113]



In the discussion, the authors say that nature may be used as part of treatment in children with ADHD. Some children do not respond to current treatments and so extra "green time" may be recommended. All children with ADHD may benefit from more time in contact with nature, greener routes to school and better views from their windows.

The consequence of removing nature from children can be likened to a malnourished child whose development is slowed and possibly damaged. How permanent this damage may be is for future generations to research but as discussed earlier the negative attitudes to nature of adults who did not have access to nature as a child are worrying.

For childhood development access to nature should be as important as a good diet, education and activity. In fact, as we have seen, nature is a vital ingredient to help all these areas to develop.

Might studies report reduced ADHD symptoms for reasons other than Green Space? Reasons and responses:

Reason	Response
Is it simply because of playing outdoors rather than the greenness?	The non-green outdoors had similar results to indoor activity.
Is it that social play was different in green areas?	When controlled for social activity the results were similar.
Is it the increase of physical activity in green space?.	When matched for active and passive activities the effect of greenness was unchanged.
Is it the increase of a specific type of exercise in green space?	When matched for a specific activity the effect of greenness was unchanged.
Were green activities preferred?	Most children preferred the TV and computer games, which caused the worst symptoms.
Were green activities synchronized with medication periods?	This was found not to be the case.

IN SUMMARY

ADHD is a significant public health problem affecting 5-10% of school children in the UK. It is characterized by overactive and impulsive behaviour and difficulty in paying attention causing disruption to those around and reducing the chance of success as an adult. Children undertaking outdoor activities in nature appear to improve symptoms of ADHD by 30% compared to urban outdoor activities and a three fold compared to the indoor environment. All children with ADHD may benefit from more time in contact with nature, greener routes to school, better views from their windows.

Nature Helping Children Cope with Stress

Stress is a normal reaction to daily events. However, the recovery from an event can vary from child to child. The same event may be stressful to one child, but another may be unaffected. This ability to cope with stress is important in reducing the onset of mental health disorders. Stressful events for children include major ones such as bereavement or divorce of a parent, physical or emotional abuse, or more routine ones such as exams, moving house or illness.

Roger Ulrich's work, described previously (see 'Psychophysiological Stress Recovery Theory') found that the positive impact of nature was more effective in a person who had been recently stressed. This was described as an evolutionary advantage and appears to be as important in children.

A study asked a small group of 16-19yrolds how they responded to stress. Sixteen said they would choose an outdoor activity, while 6 would listen to music and 4 would read. Most of the respondents preferred just walking, particularly by a river or in the woods[114].

"I do find that when I'm worried about something I tend to go for a walk along the River Eden. …I think again it's partly to do with the river, you know the sound. And it's also the fact that these trees are here, and they've been here for hundreds of years , and Okay you've had an argument, your boyfriend's dumped you, but that tree's going to be there when you come back next time. So...I think it's almost like you know kind of steady." Heather 17yrs.

In another study[115], 337 children in a rural area of New York State, with a mean age of 9yrs were selected to identify whether nature helped them cope with stressful events. As seen earlier stressful events are a major factor in mental health problems in children so reducing the impact of these events is of great significance. The mothers of these

[114] Climbing trees and Building Dens: Mental Health in Young adults and the long term effects of childhood play experience July 2004. A Report for the Institute of health research Lancaster University (2004).
[115] Wells NM and Evans GW (2003) Nearby Nature; A buffer of life stress among Rural Children. Environment and Behaviour, vol.35, No 3 311-330.

children were asked to fill in a validated questionnaire (Rutter Child Behaviour) to assess psychological distress. The children were then assessed by how much they valued themselves (Harter Competency Scale). Finally, the number of stressful events was recorded (Lewis Stressful Life Events Scale).

If nature can offer some protection to children when they are exposed to stressful events, those who have more contact with nature (measured by the Naturalness Scale) should have less distress and a better self worth. The results showed that the larger the number of stressful events, the more the psychological distress in all groups of children. The presence of nature significantly reduced the effect of stress, particularly in children with the greatest number of stressful events (see figures 18 and 19).

Figure 18. Nature moderates effects of stressful life events on psychological distress ($p<0.05$).

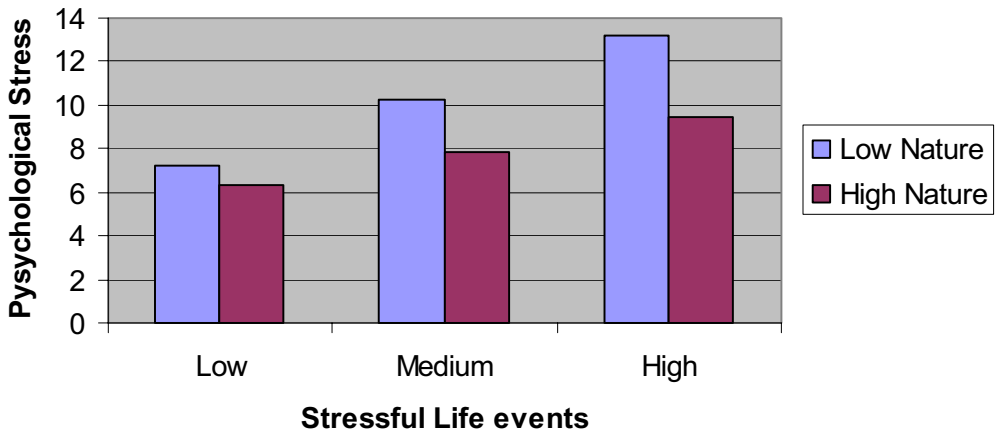
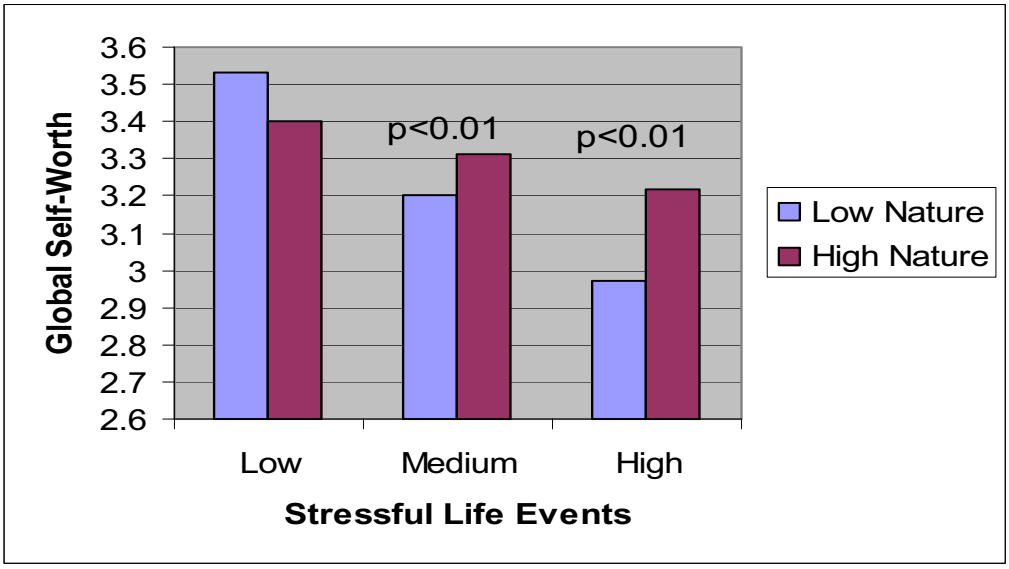


Figure 19. Nature significantly (p<0.01) moderates the effects of stressful life events on global self worth. This is more effective the greater the number of life events.



Children who were bullied, punished, relocated or suffering from family strife all benefited from closeness to nature, both in their levels of stress and in global self-worth.

IN SUMMARY

Children with stressful life events are more likely to develop mental health problems. There is evidence that those children with a high number of stressful life events were less stressed and had a higher global self worth the more they were exposed to nature. Some preliminary work shows that woodland can provide a sanctuary for both rural and urban children and reduce self-reported stress.

6. Poverty, Crime and Aggression

The Natural Environment and its Effect on Poverty, Crime and Aggression.

In the Attention Restoration Theory (described in chapter 5) it was proposed that mental fatigue is relieved when an individual comes into contact with nature. Areas of inner-city poverty are associated with crime, fear of crime and domestic violence. The stresses of poverty are relentless. This chapter looks at the evidence suggesting that natural vegetation in the inner city is associated with reduced crime and domestic violence, and improves the environment in a way that helps those in poverty to cope with life.

Aggression and Violence

There are three ways in which mental fatigue can be associated with aggression and violence.

1) Effort is needed to look at alternative ways around a confrontational situation; the more tired someone is, the less likely they are to seek an alternative[116].
2) Mental fatigue is linked to irritability[117], which is linked to aggression[118].
3) Mental fatigue leads to impulsive behaviour[119]. Losing control is a hallmark of violent behaviour[120].

A study in Chicago[121], documented the aggressive behaviour of 145 single mothers in a large housing complex, in which all aspects were similar except the surrounding natural vegetation. They were allocated housing through a random process in which those at

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[116] Dodge KA and Crick NR (1990). Social information-Processing bases of aggressive behaviour in children. Personality and social psychology bulletin 16 8-22.
[117] Warm JS and Dember WN (1986) Awake at the switch. Psychology Today, 20(4), 46-53.
[118] Coccaro EF, Bergeman CS, Kavoussi RJ and Seroczynski AD (1997) Heritability of aggression and irritability: a twin study of the Buss-Durkee aggression scales in adult male subjects. Biological Pyschiatry, 41, 273-284.
[119] *(Kaplan S (1987) Mental Fatigue and the designed environment. In J Harvey and D Henning (Eds) Public Environments (pp55-60). Edmond OK: Environmental Design Research Association*
[120] Brady KT, Myrick H and McElroy S (1998) The relationship between substance abuse disorders, Impulse control disorders and pathological aggression. American Journal of Additiction 7, 221-230.
[121] Kuo FE and Sullivan WC (2001) Aggression and Violence in the inner city: Effects of Environment via Mental Fatigue. Environment and Behaviour 33 No4 July 2001 543-571.

the top of the waiting list were given the next available flat. The study was conducted in a very deprived area with high levels of poverty. Poverty brings greater susceptibility and vulnerability to major life changes; small changes in income or illness have far reaching effects. Crime is more frequent and fear of crime places high demand on attention. Overcrowding and the lack of quiet safe areas for people to retreat to when fatigued are more common problems in poor areas.

The results of the study found that aggression and violence were both reduced significantly in those mothers that lived within a view of grass and trees compared to barren areas devoid of trees (see figure 20). There is good evidence that children who are brought up in families where violent behaviour is common are more likely to be violent themselves[122] [123]. However, the overall association between views of nature and aggression against children is less strong. One exception to this is in psychological aggression over the lifetime of the child, which was reduced significantly in areas with more nature.

Other papers have been published which also indicate that nature can reduce aggression. In a study involving 31 Alzheimer's patients nature sounds and plants were introduced during bathing time in a nursing home; a period of significant problems in aggressive patients[124]. Between 30-50% of Alzheimer's patients have agitated aggression. The group in contact with nature had significantly less aggression. In another study, patients were followed up over two summers in 5 establishments. Three had no gardens and two had gardens installed. In the patients with no gardens assaults increased significantly whereas in those surrounded by gardens assaults remained the same[125].

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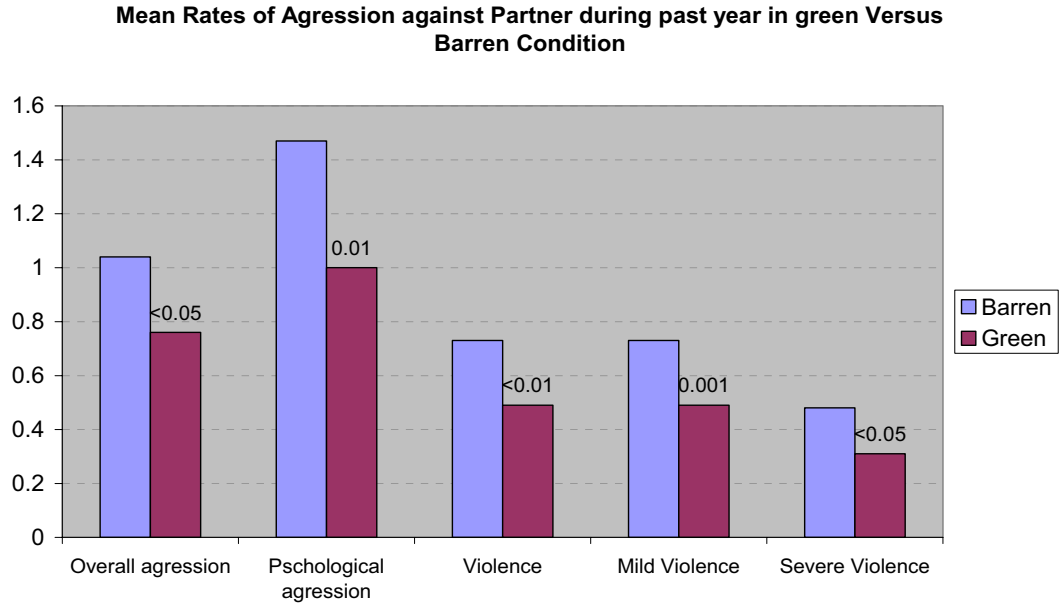
[122] Wissow,LW, Wilson ME, Roter D, Larson S and Hope IB (1992) Family violence and the evaluation of behavioural concerns in a paediatric primary care clinic. Medical Care 30 150-165.
[123] Wolfe DA, Jaffe P, Wilson SK and Zak L (1985) Children of battered women: The relation of child behaviour to family violence and maternal stress. Journal of Consulting and clinical Psychology, 53, 657-665.
[124] Whall A L, Black M E, Groh CJ, Yankou D, Kupferschmid BJ, and Foster, NL (1999). The effect of natural environments upon agitation and aggression in late stage dementia patients. Journal of Healthcare Safety, Compliance & Infection Control, 3(1), 31-35.
[125] Mooney P and Nicell PL (1992) The importance of exterior environment for Alzheimers residents: Effective care and risk management. Healthcare Management Forum, 5, 23-29.

Figure 20. Mean rates of aggression against partner during past year in green versus barren conditions. All differences were significant. [121]



IN SUMMARY

These studies support the hypothesis that a natural environment can reduce violent behaviour because its restorative process in the brain helps reduce irritability and impulsive behaviour. If further studies confirm that nature in inner-city areas can reduce violent behaviour by even small amounts, this should be seen as not only a public health intervention, but one that would have large social implications to inner city areas. The positive affect of green space appears to be entirely due to improving attention functioning.

Crime

Natural vegetation has historically been linked to crime as a natural hiding place or area where people are alone and therefore more vulnerable. Even as far back as 1285 King Edward I tried to reduce highway robberies by forcing property owners to cut back trees and shrubs from the highway edge[126].

Studies have consistently supported the view that densely wooded areas increase the general sense of vulnerability and fear[127] [128]. There is direct evidence that has linked dense vegetation with a fear of crime on both university campuses and in car parks[129]. The general consensus of all the research is that fear of crime is higher where vegetation blocks views[130]. However, a study by Kuo and Sullivan suggests that some type of natural vegetation may provide some protection from crime.

Increased Surveillance

Surveillance is an effective deterrent for crime. Many studies have shown that criminals avoid areas with greater surveillance or areas with the greater likelihood of intervention. There is also some evidence that areas in inner cities with trees are more likely to be used by children, adults and mixed age groups than are treeless spaces. In fact, the more green space, the more simultaneous users[131] [132]. Children are twice as likely to have adult supervision in green inner city areas with trees as in barren areas in the city.

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[126] Pluncknett TFT (1960) Edward 1 and criminal law. Cambridge University Press.
[127] Talbot J and Kaplan R (1984) Needs and fears: The response to trees and nature in the inner city. Journal of Arboriculture, 10 222-228.
[128] Shroeder HW and Anderson LM (1984). Perception of personal safety in urban recreation sites. Journal of leisure research, 16 178-194.
[129] Shaffer GS and Anderson LM (1985). Perceptions of the security and attractiveness of urban parking lots. Journal of Environmental Psychology, 5, 311-323.
[130] Fisher BS and Nasar JL (1992) Fear of Crime in relation to three exterior site features: Prospect, refuge and escape. Environment and behaviour, 24, 35-65.
[131] Coley RL, Kuo FE and Sullivan WC (1997). Where does community grow? The social context created by nature in urban public housing. Environment and Behaviour, 29 468-492.
[132] Kuo FE, Bacaicoa M and Sullivan WC (1998). Transforming inner city landscapes: Trees sense of safety and preference. Environemnt and Behaviour, 30, 28-59.

Significant clues of surveillance are associated with a deterrent effect on crime. Criminals may be deterred by environmental clues suggesting surveillance even when no observers are present[133]. Territorial markers have been linked to lower crime[134].

Vegetation can act as a territorial marker. In a study[135] considering views of fronts of houses, the presence and maintenance of vegetative features was the strongest predictor of territorial personalisation. In fact, there is evidence suggesting that plants and other territorial markers make properties less attractive for burglary by implying that someone is present and cares for their home territory[136] [137]. Crime may also be reduced because nature can reduce aggression and violence, as explained earlier in this chapter.

In a study[138] in a large housing complex the amount of vegetation surrounding the identical houses was measured from photographs taken from the air and the ground. The results show that those buildings with the highest amount of vegetation had:

- 52% fewer total crimes;
- 48% fewer property crimes; and
- 56% fewer violent crimes (see figure 21).

As residents were allocated to their flats randomly from a waiting list, these results cannot be explained by simply those involved in less crime choosing housing with green views. However disentangling the effect of nature from other social and environmental factors is difficult although this should not be a deterrent for more research.

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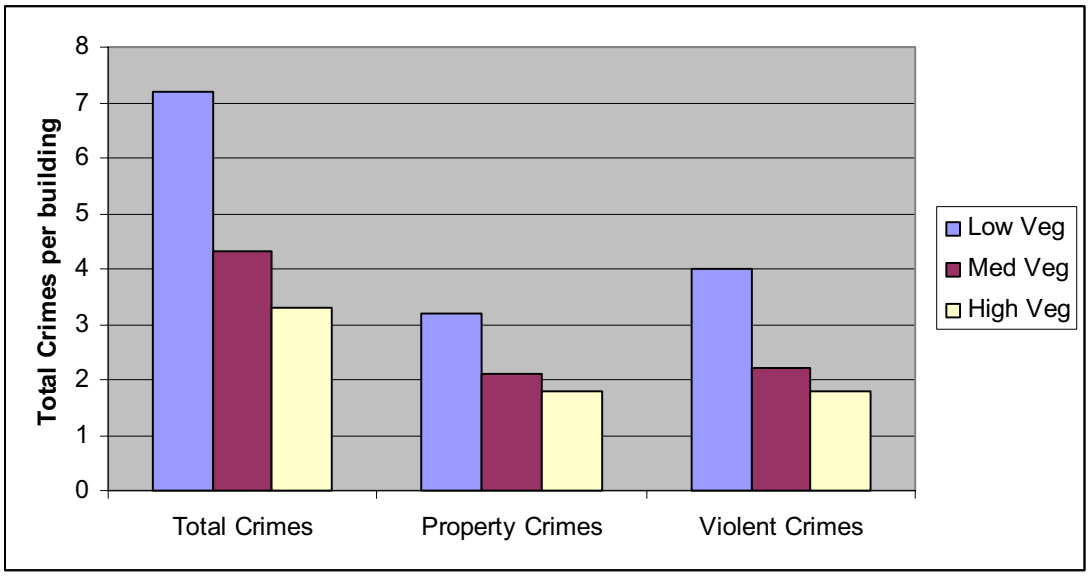
133 Newman O (1972) Defensible Space: Crime prevention through Urban Planning. New York Macmillan.
134 Perkins DD, Wandersman A, Rich RC and Taylor RB (1993) The physical Environment of Street Crime: Defensible Space, Territoriality and incivilities Journal of Environmental Psychology 13, 29-49.
135 Chaudhury H (1994) Territorial personalisation and place-identity: A Case study in Rio Grande Valley, Texas in AD Seidel (Ed). Banking on Design (pp 46-54) Oklahoma City OK EDRA.
136 Brown BB and Altman L (1983). Territoriality, defensible space and residential burglary: An environmental analysis. Journal of Environmental Psychology, (3) pp203-220.
137 Brown BB and Bentley DL (1993). Residential Burglars judge risk: The role of territoriality. Journal of Environmental Psychology (13), pp51-61.
138 Kuo FE and Sullivan WC (2001) Environment and Crime in the Inner City. Does Vegitation Reduce Crime. Environment and Behaviour 33 May 2001 pp343-367.

Figure 21. Average number of crimes per building per year for three different levels of natural vegetation. This shows a dose response: the more natural vegetation the lower the crime rate. [138]



IN SUMMARY

The Attention Restoration Theory shows that with increased contact with nature, the brain can be restored from fatigue, leading to a reduction in many unwanted symptoms such as impulsive behaviour, irritability and aggression. Studies described in this chapter point to 50% less crime and domestic violence in families with views of increased vegetation in a poor housing estate compared to identical blocks with no vegetation. If this is true and confirmed by more research, the presence of a natural environment in inner city residential areas should be considered an essential part of design rather than simply as aesthetically pleasing.

Coping With Poverty

Poor inner-city neighbourhoods may be especially vulnerable to chronic mental fatigue and fatigue related aggression. This is mainly due to the added attentional demands of poverty that are unremitting. Constant challenges of money, job, caring for children and fear of crime require effortful problem-solving and reasoning. The constant vulnerability to outside influences reduces people's control over their lives. Even minor temporary setbacks, such as a child's illness can have a greater effect on the life of a poor person compared to someone with adequate financial means.

Research in the UK shows that the prevalence of the most common mental disorders, anxiety and depression, has been shown to be consistently associated with unemployment and measures of poverty, independent of occupational social class. Areas of poverty create an environment for depression that is additional to these individual factors[139].

Unemployment is more important in maintaining episodes of depression or anxiety rather than causing them. However, financial strain is a powerful independent predictor of both the onset and maintenance of episodes of common mental disorders. Poverty and financial strain are therefore associated with significant increases in anxiety and depression[140].

A large study of 250,782 people in Holland has shown that the percentage of green space inside a 1km and 3km radius had a significant relation to perceived general health. This was strongest in those of lower social class and the elderly. In areas of

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139 Yen IH and Kaplan GA (1999) Poverty area residence and changes in depression and perceived health status: Evidence from the Alameda County Study. Int.J.Epidemiology 1999:**28**:90-94

140 Weich S and Lewis G (1998) Poverty, unemployment, and common mental disorders: population based cohort study. BMJ 317.

90% green environment 10.2% of people felt unhealthy but this increased to 15.5% when only 10% of the environment was green[141].

A study in Chicago[142] investigated whether the natural environment could help cope with the problems that are accentuated by poverty. The study looked at single female parents of mainly African-American origin living in flats that were identical except that some of the tower blocks were surrounded by grass and trees and some by barren earth or concrete. The residents were allocated the flats randomly from a waiting list reducing the chance that there was a self selected bias of choice of residence. The main question was: "Can low-level nearby vegetation enhance the management of major life issues by reducing attentional fatigue in those living in poverty?"

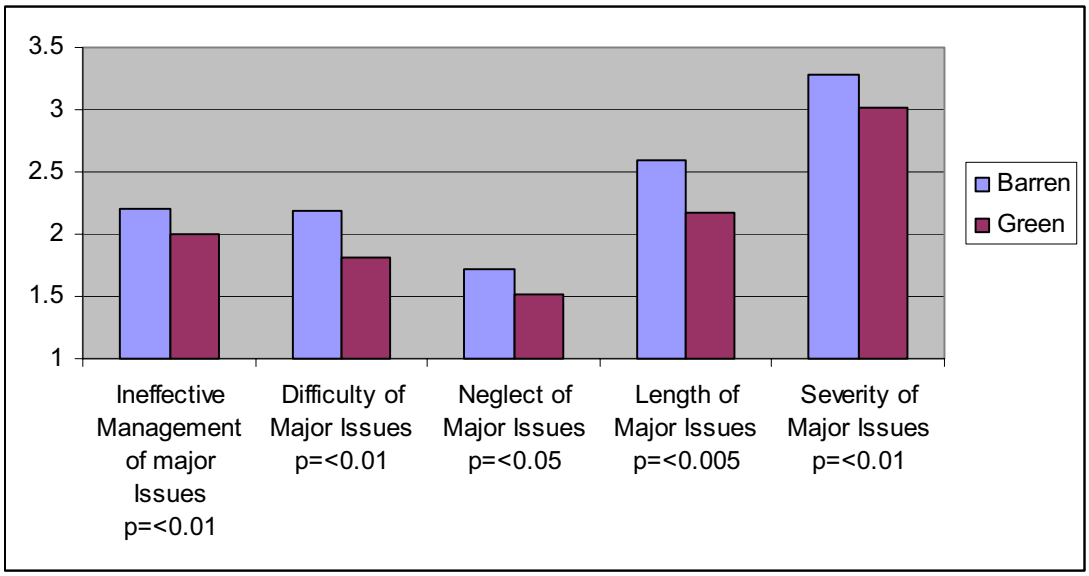
Individuals were asked what their main goals were (the most important were getting a job, moving out of a flat or going back to school) and what their main problems, worries and concerns were (most important were money and parenting problems, followed by safety from crime and violence). The results showed that those living in a greener environment were better able to cope with major life issues than those living in flats with a barren environment. This gave the individuals in the study a better chance to make difficult decisions, to regain some control in their life and be better able to cope in general (see figure 22).

Given the link between poverty, anxiety and depression, and the fact that these conditions can be caused by the loss of control in one's life, there may be a further link between increased nature and reducing the prevalence of anxiety and depression in those living in poverty. This requires more research.

[141] Maas J, Verheij RA, Groenewegen PP, de Vries S, Spreeuwenberg P.Green space, urbanity and health: how strong is the relation? J Epidemiology Community Health 2006;60:587-592

[142] Kuo F (2001) Coping with Poverty: Impacts of environment and attention in the inner city. Environment and Behavior, Vol 33(1), January 2001.

Figure 22. Surrounding natural vegetation and the ability of single mothers to cope with major life issues[143].



IN SUMMARY

Poverty and financial strain are associated with significant increases in anxiety and depression. There is a significant association between natural vegetation surrounding poor housing and the reduction in aggression, crime and the ability to cope with stressful situations among poor residents. These findings fit in with the Attention Restoration Theory, which states that attention fatigue can be restored by views of nature. Improving the environment by including more greenery in poor inner city areas may well reduce the risk of major inner city problems which have traditionally been addressed from a social angle rather than environmental.

[143] Kuo F (2001) Coping with Poverty: Impacts of environment and attention in the inner city. Environment and Behavior, Vol 33 No 1 January 2001.

7. The Older Person and the Effect of Nature

Between 1995 and 2035 the number of people aged over 85yrs will double, and with people living longer the need for residential and health care will increase[144]. Increased age is associated with high risk of many diseases (strokes, chronic obstructive pulmonary disease, arthritis, dementia, diabetes, heart disease and many cancers) all of which cause debilitation and require more intense care in nursing homes or hospital wards.

The main aim of health care for the elderly is to add life to years rather than years to life, so that the elderly have increased quality of life with more independence and the ability to remain as a part of their own community. The concept of 'disability free years life expectancy' has been defined as the average number of years that a person of a given age can expect to live free of disability. Although life expectancy in 1999 was 75 yrs this includes on average 15 yrs with longstanding illness or disability. For women who will live to the age of 80 the average period with longstanding illness or disability is 17 yrs[145].

As the number of elderly increases, the availability of informal carers will decrease, leaving more elderly living alone or with an elderly spouse. There are 5.7 million carers looking after a disabled relative or friend and half of those being looked after are over the age 75 yrs[144].

Health spending on the elderly is not just related to age. This is a myth. The main cause of rising costs is the amount of disability, particularly in the last few years and months of life[146]. People are more likely to spend their last years with a disability or requiring intensive medicine. It is essential that alternative ways of maintaining disability-free years are found that will ensure a total improvement in quality of life that is affordable. The current problems of social isolation, obesity and inactivity in those approaching old

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144 Royal Comission on Long Term Care (1999) With respect to Old Age. London.
145 Department of Health (1999) Saving Lives: Our Healthier Nation. DH London.
146 Gray A (2005) Population Ageing and Health Care Expenditure. Ageing Horizons. **2**.15-20.

age in the next twenty years will cause significant rise in mental ill health, diabetes, COPD and Osteoarthritis unlike heart disease and stroke which are falling. Unfortunately this is likely to cause a significant rise in disability and a greater need for caring.

Contact with nature appears to be effective in maintaining activity, concentration and improved quality of life in an elderly person. In a residential home this may appear as a loss of revenue as green space takes up an area that could be used to build more rooms. However, the cost of withholding contact with nature from a resident appears to be high, with significant reduction in quality of life. This could lead to a simple economic benefit as residential homes with green areas or gardens should be in greater demand.

Elderly Care Homes

Many studies of the elderly living in residential care indicate positive wellbeing of residents and green environments. Given the amount of time the elderly spend in the home, the immediate outdoors is particularly important for this population. Ageing individuals experience an ever-contracting "life-space" as they decline physically and travel less and less. The elderly appreciate natural settings where they don't need to be active. For residents of retirement homes, passive involvement with a green environment by looking from windows and excursions into nearby outdoor green areas are important for wellbeing and satisfaction.

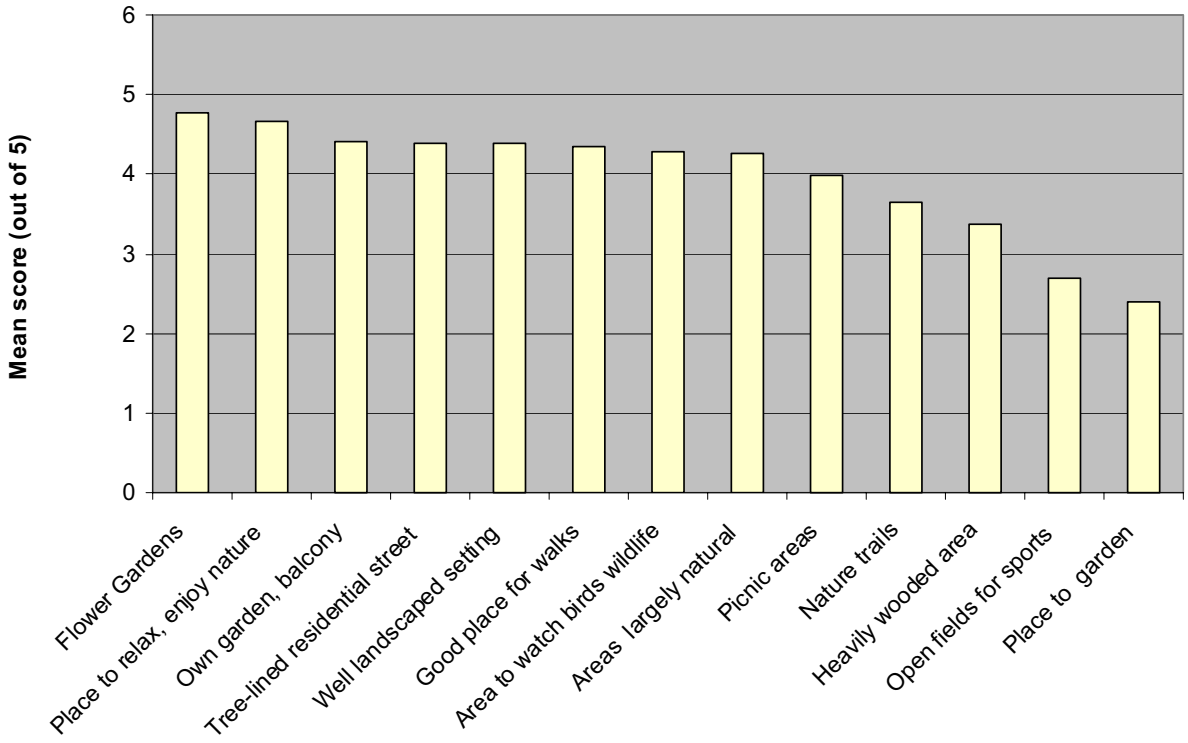
A study in two residential homes with different aspects of nature found that all residents in both homes rated access to nature as of very high importance[147]. They found that flower gardens, plantings and places to relax and enjoy nature gained the highest scores (see figure 23)

The elderly who found that they had close access to a place where they could relax and enjoy nature showed significantly greater satisfaction in the home they were in. Even

[147] Talbot JF and Kaplan R (1991) The benfits of nearby nature for elderly apartment residents. In'l.J.Aging and human development, Vol. 33(2) 119-130,1991.

natural views from the window (trees, grassy areas) increased satisfaction. Residents who had close access to "largely natural areas" and "good places to walk" had a greater life satisfaction, as did those whose favourite outside view was of nature. Most new residential homes are built with no regard to natural outlooks or views of trees, (despite the evidence that these are so important to residents). A cost-benefit analysis of designing a natural outlook and gardens into residential care homes is urgently required.

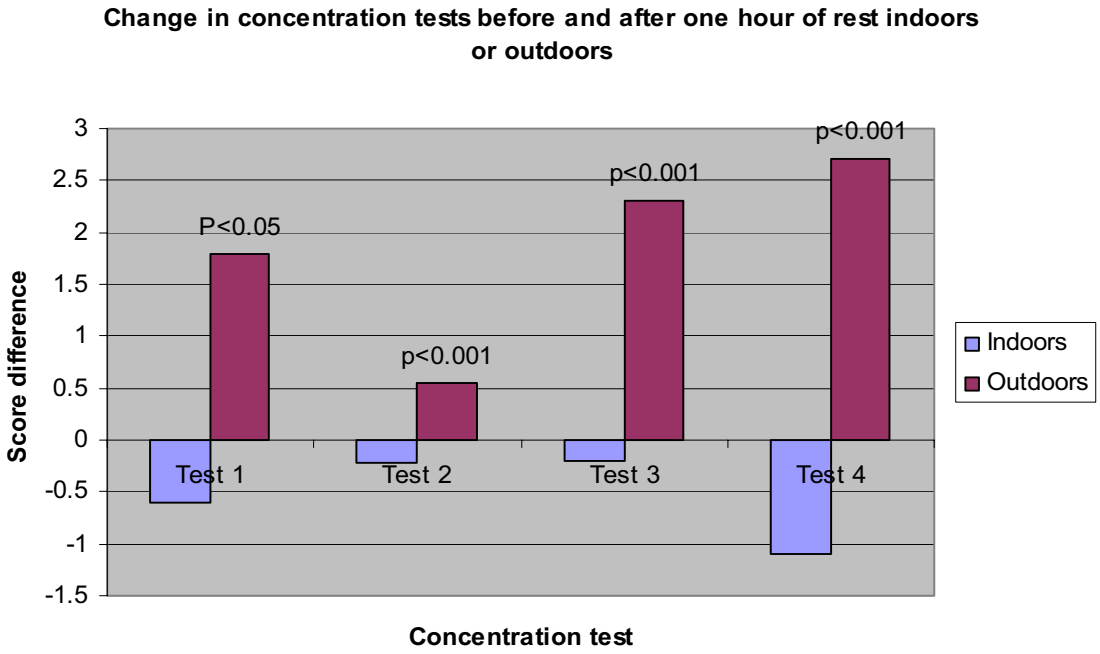
Figure 23. Means of nature importance items in a sample of 48 elderly residents.[148]



In a small but well designed study in Sweden, a group of 15 elderly residents with an average age of 86yrs had tests of concentration measured before and after a rest period in a garden or indoors. This was a crossover trial meaning that each person acted as

their own control[148] (see figures 24 - 26). The elderly showed a much greater improvement in their powers of concentration after spending one hour of rest in the garden compared to remaining indoors. The results show that despite the small numbers there was a significant improvement in concentration levels in all four tests. Concentration is important to the elderly, as they can become easily disorientated and confused, and this can lead to agitation, depression and anxiety. A lack of mental stimulation also increases the risk of confusion and dementia.

Figure 24.

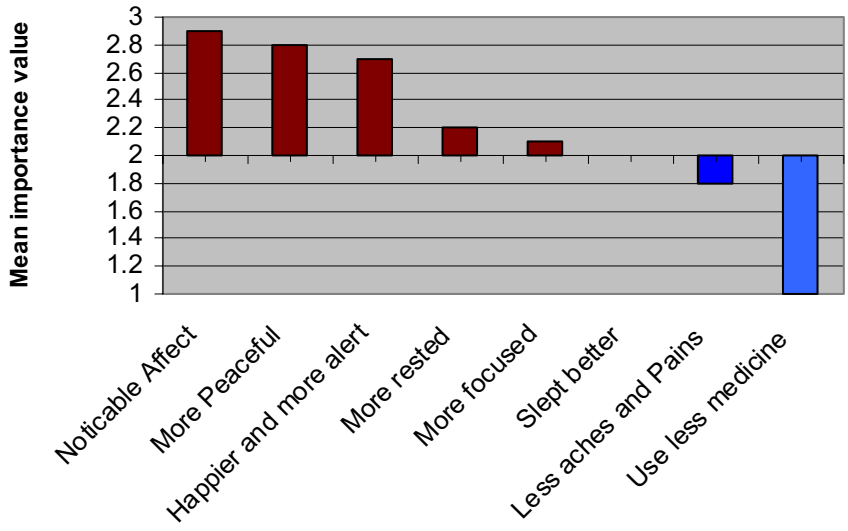


Access to nature is innately reassuring and understandable (coherence) and provides the fascination aspect that rests the brain. This calming affect occurs with an increase in alertness, whereas medicines that calm the elderly come at a cost of sedation and a consequential lack of control. Most elderly people in the Swedish Study felt that being in nature had a noticeable effect on them, with the main benefits arising through being

[148] Ottosson J and Grahn P (2005) A comparison of leisure time spent in a garden with leisure time spent indoors: On measures of restoration in residents in geriatric care. Landscape Research, 30 1 23-55 Jan 2005.

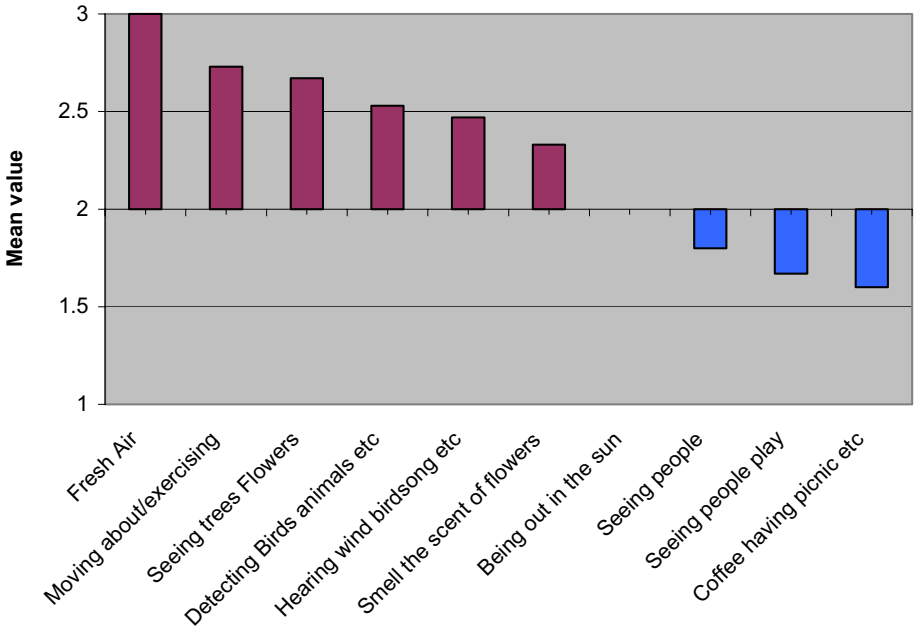
more peaceful, happier, more alert and more rested. The more physical aspects of aches and pains, and taking less medicine, appeared not to be relevant.

Figure 25. Results of a question to 15 very elderly residents: What effect could you notice from being outdoors? Do not agree=1 Do agree = 3 neither/nor = 2.



The reasons the elderly gave for spending time with nature are dominated by a perfect score for fresh air (figure 26). This is closely followed by exercise and the 'nature effect' of seeing hearing and smelling nature. This nature effect does not apply to everybody; some individuals find it very important whereas others not important at all. The improvement in life satisfaction was greatest in those who felt they had closest access to nature. This may be because the home was closer to nature or because those who seek out nature are more satisfied. This needs to be examined in greater detail.

Figure 26. Results of a question to 15 very elderly residents: which are your reasons for wanting to be out in the gardens? Do not agree = 1. Do agree = 3. Neither/nor = 2.



Healing Gardens and Alzheimer's Disease

The commonest form of dementia is Alzheimer's disease, which makes up 50% of all dementias. This is a degenerative disease of the brain. There are specific areas of the brain that are affected by plaques and tangles of a protein that can affect up to 40% of the brain. Dementia currently affects over 750,000 people in the UK. This is expected to rise to over 1.8 million people by 2050. Currently over 18,000 people with dementia are aged under 65 years. Dementia affects one person in 20 aged over 65 years and one person in five over 80 years of age.

John Zeisel is a leading researcher in developing gardens for Alzheimer's patients and this is his description of how to design a successful healing garden according to the affects that Alzheimer's has on the brain[149]. Four parts of the brain are affected and a healing garden attempts to help the person compensate for the loss of these four functions:

- The Hippocampus (in the very centre of the brain) distributes and retrieves memories from the brain's memory bank. This area is damaged early on in the disease and so memory fails. Unfortunately, the memory of place and location are located in the areas that are damaged. A successful healing garden with distinguishing sights and smells can remind the person with dementia where they are without the need for a strong memory will.
- The amygdala (next to the Hippocampus) provides our emotions and is damaged later in the disease. Alzheimer's patients tend to be very sensitive to emotions so the successful use of the garden will be to increase a sense of positive wellbeing with smells, views and wildlife.
- The frontal lobe (large "modern" part of the brain at the front) allows us to organise and plan, and find the way home. A successful healing garden is one that is self-organising and requires little input of planning.
- Finally, the Charismatic nuclei keep time, telling us when to wake and when to sleep. Being outside at differing times of day with different intensities of daylight

[149] Zeisel J and Tyson M (1999) Alzheimer's treatment Gardens. In Cooper Marcus C and Barnes M, Healing Gardens: Therapeutic Benefits and design recommendations. John Wiley and sons.

can reinforce a structure in the day so easy access to the garden is needed for it to be successful.

The garden can therefore link the past memories with the present, allowing some kind of order in a mind that is continually confused and concerned. It provides a home-like quality for the patient. This has been shown to have many advantages, including improved intellectual and emotional wellbeing, enhanced social interaction, reduced agitation and wandering, improved functionality and greater preference and pleasure[150].

As described earlier, access to an outdoor garden can reduce violent episodes over time[151]. Even natural sounds, such as bird song and pictures of nature, can calm Alzheimer patients who are normally agitated[152].

The Health Benefits of Gardening for the Elderly

Gardening is the commonest and most enjoyed pursuit of older adults. Gardening can be continued for much longer into old age than sport. The health benefits have long been known, with hospitals encouraging patients to tend the gardens in rehabilitation hospitals at the turn of the century. A French study of over 2,000 people showed that regular gardening halves the risk of developing dementia[153].

Moving into residential care significantly reduces the opportunities of gardening for an elderly person. This takes away a sense of purpose and contact with nature, but this can

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150 Day K, Carreon D and Stump C (2000) The Therapeutic Design of Environments for People with Dementia: A Review of the empirical research. 2000,**40** No 4 397-416.
151 Mooney P and Nicell PL (1992). The importance of exterior environment for Alzheimers residents: Effective care and risk management. Healthcare Management Forum, 5, 23-29.
152 Whall AL, Black ME, Groh CJ, Yankou D, Kupferschmid, BJ, and Foster NL (1999) The effect of natural environments upon agitation and aggression in late stage dementia patients. Journal of Healthcare Safety, Compliance & Infection Control, 3(1), 31-35.
153 Fabrigoule C, Letenneur L, Commenges D, Barberger-Gateau PJ and Am Geriatri Soc (1995) May; 43(5): 583-4. Social and leisure activities and risk of dementia: a prospective longitudinal study.

be partly replaced by tending to plants in courtyards and indoor plants[154]. The reasons for gardening amongst residents in a retirement home were associated with[155]:

- The therapeutic value of gardening,
- The satisfaction of seeing the results,
- Being able to share the enjoyment with other residents.

Gardening is the intimate contact with living things. One of the major constituents of high quality life in old age is the feeling of being needed. Plants may contribute to this feeling and provide purposeful activities since they require daily care. Plants grow and change with the season. The elderly are often uncertain about their future so the changing appearance of plants can be seen as a positive future[156].

The benefits shown from gardening are to[157]:

- Improve physical health,
- Improve rehabilitation from Long Term Illnesses,
- Reduce symptoms of dementia,
- Improve behaviour,
- Improve attitude and wellbeing,
- Decreased agitation.

These positive effects derive from an enhanced sense of self-worth and purpose in life, increased level of physical and mental activity, establishment of a sense of community and support from others[158].

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154 Stoneham J and Jones R (1997) Residential Landscapes: their contribution to the quality of life and health status in quality of older people's lives in: Wells SE (ed). Horticultural therapy and the older adult population. New York, The Haworth Press. Pp 17-26.
155 Brascamp W and Kidd JL (2004) Contribution of plants to the wellbeing of retirement home residents. Acta Horticulturae 639: 145-150.
156 Gaskins S and Forte L (1995) The meaning of hope: implications for a nursing practice and research. Journal of Gerontological Nursing 21(3):17-24.
157 Haas K, Simons S and Stevenson N (1998) Older persons and horticulture therapy practice in Simpson S and Strauss M (eds). Horticulture as therapy. Principles and practice. New York, The food product press, pp 231-25.
158 Mackenzie E, Agard B, Portella C, Mahangear D, Barol J and Carson L (2000) Horticultural therapy in long-term care settings. Journal of American Medical Directors Association 1(2). 69-73.

A 7-week programme of indoor horticultural therapy resulted in a significant increase in psychological wellbeing among older residents in a residential home compared to the control group, which actually showed a decrease[159]. A study following up the elderly who underwent horticultural therapy for older people twice a week for six months showed an increase in their well-being. The rating of irritability paranoia and suspicion, and a scale measuring physical and mental impairment decreased compared with a control group during therapy. In particular staff noted an increase in attention span and initiative among participants[160].

IN SUMMARY

There is good empirical evidence that the elderly value contact with nature very highly, as it allows them to have fresh air and experience nature through all the senses. A wildlife rich environment will therefore provide increased positive stimulation for the elderly. Access is important and, since an elderly person's world is reduced as they become less active, access to even a small pocket of nature is important. The benefits to older people of gardening include increased physical and mental activity, a sense of purpose and meeting friends. This contact with nature significantly improves concentration, and for patients with dementia it can introduce positive experience, improve their sense of coherence, and reduce aggression and agitation.

[159] Barnicle T and Midden K (2003) The effects of a horticulture activity program on the psychological wellbeing of older people in a long term care facility Hort Technology 13:81-85.
[160] Mooney PF and Milstein SL (1994) Assessing the benefits of a therapeutic horticulture program for seniors in intermediate care. In Francis, M, Lindsey, P and Rice JS. Eds. The healing dimensions of people plant relations. Proceedings of a research symposium. Centre for design Research, Department of Environmental Design, University of California pp 173-187.

8. Nature and Hospitals

Hospitals have had a long history associated with nature. Today there is little evidence of this history, yet the need remains. A study in the US asked those in hospital (both as patients and staff) where they went when they were stressed. 95% said that they experienced a positive change when they went outside, with 69% saying that trees and plants were particularly helpful. (Table 3)

Table 3. Questionnaire given to 143 staff and patients in hospital to assess which aspects of the outside benefited them the most[161].

Qualities respondents named as helpful in attaining a mood change in four hospital garden settings.	% (multiple answers)
Trees and plants. Flowers, colours, greenery, heritage trees, being in nature, seasonal changes.	69
Psychological or social aspects. Peaceful, escape from work, openness/large, privacy/secret places, Oasis, Companionship. Watching others.	50
Features involving the senses. Birds, squirrels, wind/fresh air, water, quiet, light sun.	38
Visual qualities relating to more than plant materials	26
Practical features. Seating, well maintained, accessibility	17
Don't Know	8

A study asked 300 people asked to recall a time and place when they, or someone close to them felt helpless or wounded or in pain. They were then were asked to visualise "an environment that would be healing for that wounded person". Every environment cited

[161] Cooper, Marcus and Barnes (1995) Gardens in Health care Facilities: Uses, Therapeutic Benefits, and design considerations. Martinez, CA: the Centre for Health Design.

envisaged nature (trees, grass, water, sky, rocks, flowers and birds) as a significant healing agent[162].

However, despite people's feelings towards a healing environment the hospital remains one of our most nature-devoid buildings, with windowless rooms served by strip lighting showing off bright white high-tech machinery. There appears to be a mismatch. Hospital gardens developed in the Middle Ages, when hospitals and monasteries looking after the sick often incorporated an arcaded courtyard where residents could find shelter. St Bernard (1090-1153) wrote of his intensions of the hospice in Clairvaux, France.

"*Within this enclosure many and various trees…make a veritable grove…the sick man sits upon the green lawn…he is secure, hidden, shaded from the heat of the day…for the comfort of his pain, all kinds of grass are fragrant in his nostrils. The lovely green of herb and tree nourishes his eyes…. The choir of painted birds caresses his ears…the earth breathes with fruitfulness, and the invalid himself with eyes, ears and nostrils, drinks in the delights of colours, songs and perfumes*" [163].

With the decline of the monasteries in the Middle Ages, the sick were looked after by the Church and civic authorities. The Catholic tradition led to the design of long wards where the priest could be viewed from each bed. But some hospitals did continue with courtyards of trees and grass. John Howard (1726-1790), on his travels through Europe, admired the hospitals with a flow of fresh air, the chance for patients to see gardens through their windows and doorways, and the opportunity for convalescing patients to walk in the gardens.

During the 18th and 19th centuries, there was a resurgence of interest in using fresh air and sunlight to treat tuberculosis, and in hospitals with extensive grounds to treat

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162 Olds AR (1985) "Nature as Healer" in J.Weisner and T. Yeomans. Readings in Psychosynthesis: Theory, Process, and practice. Toronto, Ont: Institute for Studies in Education.
163 Warner SB (1995) "Restorative Gardens: Recovering some Human Wisdom for Modern Design. Unpublished paper.

psychiatric patients who instead of being punished to correct their illness were being rehabilitated.

The term "stress" implies a process of responding to events or environmental features that are challenging, demanding, or threatening to well-being. Hospitals are stressful buildings, due to: impending surgery, pain, uncertainty in diagnosis, loss of control, lack of privacy, depersonalisation through bureaucracy and uniforms, limited visiting hours and disruption of routine including, work and social relationships[164] [165]. Staff working in hospitals are also under considerable stress caused by overload of demanding responsibilities, rotating shifts, the emotional load of patients and stressful events such as the death of a patient. Stress can affect the body with raised pulse rate, high blood pressure and anxiety. It can also reduce the pain threshold, resulting in more pain relief being needed. A stressed patient is more likely to have a negative outlook to a procedure and may be less compliant to difficult procedures.

Earlier in this report, it was stated that nature can reduce stress. Hospital gardens can provide contact with nature and therefore can reduce stress. Patients who use a hospital garden say that they need it to get away from it all and to gain back some control: "*It's a good escape from what they put me through. I came out here between appointments …I feel much calmer, less stressed*".

Former patients all say that their most widely shared preference regarding the physical environment of healthcare facilities was for access to nature[166]. Patients who were severely disabled and were bedridden assigned a high preference to nature[167]. Hospital settings not only have a lack of nature (despite it being factor that appears to be beneficial to everyone), but also have started to display art that actually increases

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164 Gatchel RJ, Baum A and Krantz DS (1989) An introduction to health psychology, 2nd ed. New York: McGraw-Hill.
165 Connelly AG (1992) an examination of Stressors in the Patient Undergoing Cardiac Electrophysiological Studies. Heart and Lung Vol.21 pp 335-342.
166 MacRae S (1997) Consumer Perceptions of the Healthcare environment: An Investigation to determine what matters. Preliminary report published by the Centre for Health Design, Martinez CA. and the Picker institute Cambridge, MA.
167 Verderber S (1986) Dimensions of Person-Window Transactions in the Hospital Environment" Environment and Behaviour Vol 18, pp 450-466.

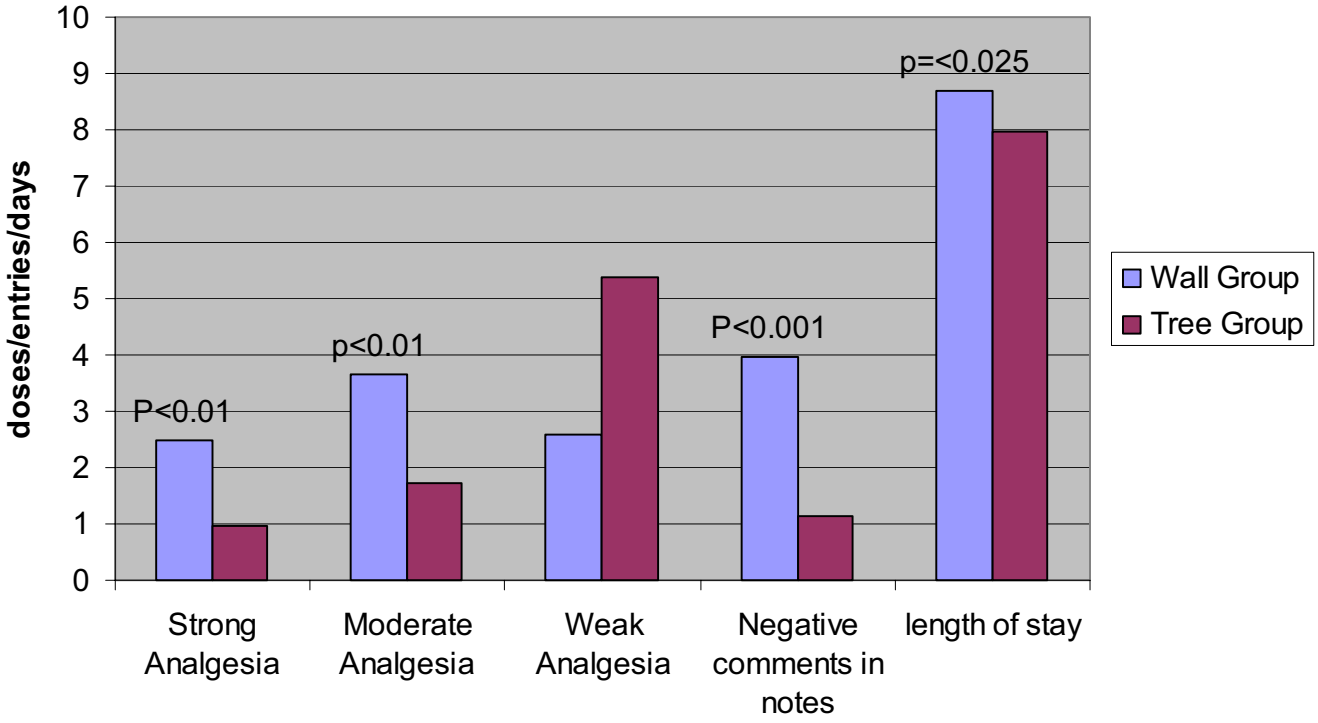
anxiety and stress in patients. Records were kept in a psychiatric unit of patients who had attacked a series of paintings hanging on the wall. They found that all 7 of the paintings that were abstract and ambiguous were attacked, but representative paintings were left intact[168]. Patients are often already in a negative state and so ambiguous paintings arouse may increase feelings. On the other hand the same paintings are often seen as positive by staff.

Another study showed natural scenes and abstract paintings to patients recovering in intensive care from heart surgery. Patients who were shown pictures of natural landscapes had less anxiety and less need for strong painkillers. However, abstract paintings evoked more anxiety and in some patients the strong negative response necessitated the early removal of the painting[169].

There have been many studies in hospitals demonstrating the effect natural scenes have on pain relief and recovery time. Perhaps the most famous is Roger Ulrich's initial study on post operative recovery from gall-bladder surgery, in which patients were case-controlled into 23 matched pairs to recover in the bed looking out onto either a group of deciduous trees or a brick wall. Those patients looking out on the natural scene had shorter post-operative stays, fewer negative comments (according to nursing notes) and lower scores of minor postoperative complications (nausea, headache, etc).

[168] Ulrich RS (1986) "Effects of Hospital Environments on Patient Well-Being." Research Report from Department of Psychiatry and Behavioural Medicine. Vol. 9, 55. Trondheim. Norway Dept of Pyschiatry and Behavioural Medicine. University of Trondheim.
[169] Ulrich RS (1993) "Biophilia, Biophobia, and natural landscapes" in SA Kellert and EO Wilson, Eds. The Biophilia Hypothesis. Washington DC: Island Press/Shearwater. p 74-137.

Figure 27. Comparison of 23 matched pairs of patients (controlled in all aspects apart from a tree or brick wall view from the window) following cholecystectomy. The analgesia is from days 2 to 5. The comments are taken from nurses' notes and the length of stay is in days[170].



In another study, 166 patients facing open heart surgery were shown one of four panels (**Nature:** open view with water, **Nature:** closed forest, **Abstract**, and **Control:** white panel). The results showed that those exposed to the open nature panel had less post-operative anxiety than the other three groups, including those exposed to the view of the closed forest[171].

Nature can reduce blood pressure and stress and restore the concentration area of the brain. Ulrich's experiment on gall-bladder surgery recovery (above), the "tree group" were discharged earlier and also needed less pain relief and complained less than the

[170] Ulrich RS (1984). View through a window may influence recovery from surgery. Science, 224,420-421.
[171] Ulrich and Lunden (1990) Effects of nature and abstract pictures on patients recovering from open heart surgery. Paper presented at the international Congress of Behavioural Medicine, Uppsala, Sweden.

"wall" group. Is this a one off or can it affect other hospital patients and residents in nursing care?

A study published in the medical journal *Chest* showed that patients undergoing a bronchoscopy who were shown pictures of nature with natural sounds (birdsong) had significantly less pain than those in the control group - by a factor of four. Even though the intervention patients had more invasive procedures they did not require more medication. The authors commented "*That these patients did not require higher doses of analgesia or sedation is remarkable and it suggests that the intervention might have exerted a drug-sparing effect*" [172]. Another study looked at burns patients who had painful dressings changes. Those who watched a nature video had less pain and anxiety than the control group[173].

Patients are not satisfied with highly technology-focussed aspects of medicine, which is leading to a sustained rise in alternative therapy. This report suggests that nature offers a method of restoring a balance between necessary technology and a more holistic approach to medicine.

Cancer patients are under extreme pressure to cope with the disease itself, the treatments, which often have difficult side effects, and relationships with staff, family and friends. These intense demands are placed over long periods of time resulting in exhaustion. The constant readjustments to try to make sense of their changing situation rapidly deplete directed attention capacity. This loss of concentration results in a difficulty in understanding information relevant to major decisions. As discussed in chapter 5, nature can restore the direct attention of the brain.

A study of breast cancer patients found that those who performed 30 minutes of restorative behaviour three times a week were significantly better in their total attention score. This increased capacity for concentration and improved decision making.

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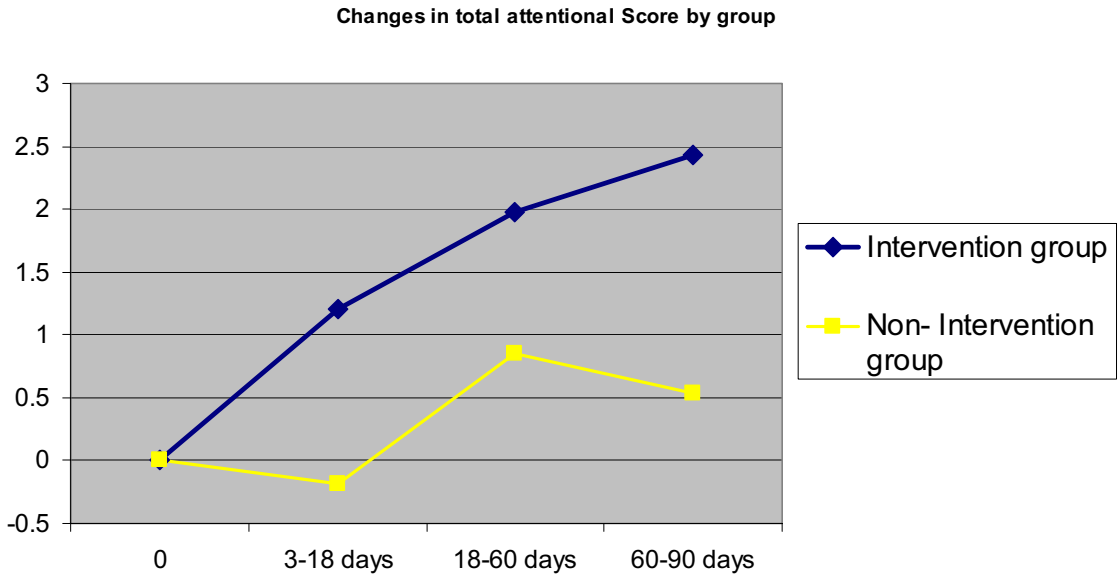
172 Diette GB, Lechtzin N, Haponik E, Devrotes A and Rubin HR (2003) Distraction therapy with nature sights and sounds reduces pain during flexible bronchoscopy: a Complimentary Approach to Routine Analgesia. Chest 2003; 123;941-948.

173 Miller AC, Hickman LC and Lemasters GK (1992) A distraction technique for control of burn pain. J Burn Care Rehabil 1992 Sep-Oct;13(5):576-80.

Figure 28. Improvement in attention score in cancer patients performing restorative behaviour.



The patients involved were instructed on the types of behaviour that were restorative and signed an agreement to undertake 30 minutes 3 times a week of:

- Sitting and walking in the natural environment,
- Observing a natural view (trees, clouds, a sunset),
- Tending green living things of all kinds (Gardens, Flowers, Plants),
- Sitting by water,
- Observing wildlife,
- Caring for/playing with pets, or
- All activities that you do for pure enjoyment, such as making or collecting things.

IN SUMMARY

Patients universally agree that being in contact with nature improves their recovery from illness, operations or mental ill health. For centuries hospitals have been built within

grounds surrounded by trees or containing small gardens or courtyards that can be seen from the patients' beds or visited from the ward. However, this practice has stopped and has been replaced by artificial lighting, windowless rooms and worse, abstract art that actually increases stress and anxiety in patients.

There is good evidence that patients recovering from illness benefit from contact with nature. Stress is reduced, and there is greater satisfaction, a reduction in strong pain-killers and greater ability to cope with the demands of treatment and understand diagnoses. It would appear that hospitals without any accessible or viewable natural green space are going against the current evidence, and are suboptimal as a location for medical treatment and recovery.

Nature and Communities

What makes a neighbourhood? What draws people together and makes them a community? This has been the focus of discussion by many researchers, over many years[174] [175]. Most of this research has been based on factors such as building design and type of people within the neighbourhood. Until recently natural vegetation has not been addressed. A study of space outside a housing complex found that it was more likely to be used if it contained vegetation[176]. The theory was that the trees and natural vegetation were more likely to draw people out of their homes and therefore they were more likely to increase contact and informal surveillance and so strengthen the community and reduce crime. Coley et al suggested that this increased interaction had important implications for the vibrancy of the community. This is in line with the thinking of others[177].

Does the addition of trees and grass strengthen neighbourhoods? Is it a cause or an association? A photo simulation study compared featureless, barren common spaces amongst high-rise flats with the same space with trees and grass superimposed. Inner-city residents disliked these barren areas, but showed a significant preference for the spaces once the trees had been added. One in three of these people said that they would use the space more if trees were planted[178].

Work in an inner-city area with high-rise flats showed that not only did people use common space with trees and grass more often than less vegetated areas, but that this was a predictor of stronger social ties. The area's residents had no influence on which

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174 Congress for New Urbanism (1999) Charter of the new Urbanism: Region/ Neighbourhood, district and corridor/block, street and building. New York: McGraw-Hill.
175 Kelbaugh, D (1989) The Pedestrian Pocket Book. A new suburban design strategy. New York; Princeton Architectural Press.
176 Coley RL, Kuo FE and Sullivan WC. (1997) Where does community grow? The social context created by in urban public housing. Environment and Behaviour, 29(4), 468-492.
177 Newman O (1972) Defensible space. New York: Collier.
Crowe T (1994) Understanding crime prevention through environmental design. Planning Commissioners Journal 16.5
178 Kuo FE, Bacaicoa M and Sullivan WC (1998) Transforming inner-city neighbourhoods: Trees, sense of safety, and preference. Environment and Behaviour, 30(1), 28-59)

apartment they were allocated, as this had been undertaken by a housing association. They also had no influence on the green space outside their apartments. The residents with increased green space had more social activities, more visitors, knew more of their neighbours and said that their neighbours were more concerned with helping and supporting each other. Finally, they had a stronger feeling of belonging[179].

A study of low-rise flats did not show any difference between areas of green and those that were barren. This is the only negative study result relating to green space, and may be due to the interviewing being undertaken in the homes, thus introducing a possible bias in the results towards those that are more likely to not be socialising.

A more recent study looked at how these spaces were used during the day, and supported the hypothesis that green space encourages socialising[180]. The results of this study are shown in figures 29 and 30. They show that there is a 90% increase in individuals in green space compared to barren space and 83% more people socialising. This is good evidence that common areas with trees and grass are more likely to be used for socialising.

[179] Kuo FE, Sullivan WC, Coley RL and Brunson L (1998) Fertile Ground for Community: Inner-City Neighbourhood Common Spaces American Journal of Community Psychology 26, 6,1998.
[180] Sullivan WC, Kuo F and DePooter SE (2004) The Fruit of Urban Nature: Vital Neighbourhood Spaces. Environment and Behaviour 36(5) 678-700

Figure 29. Analysis of variance comparing mean number of individuals involved in social activities in outdoor spaces in low and high green-cover conditions.

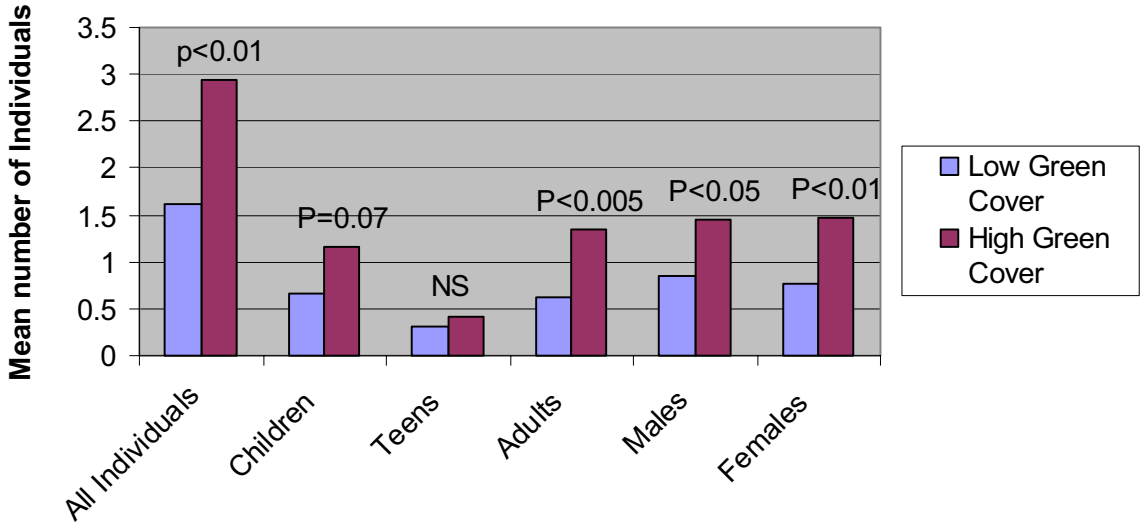
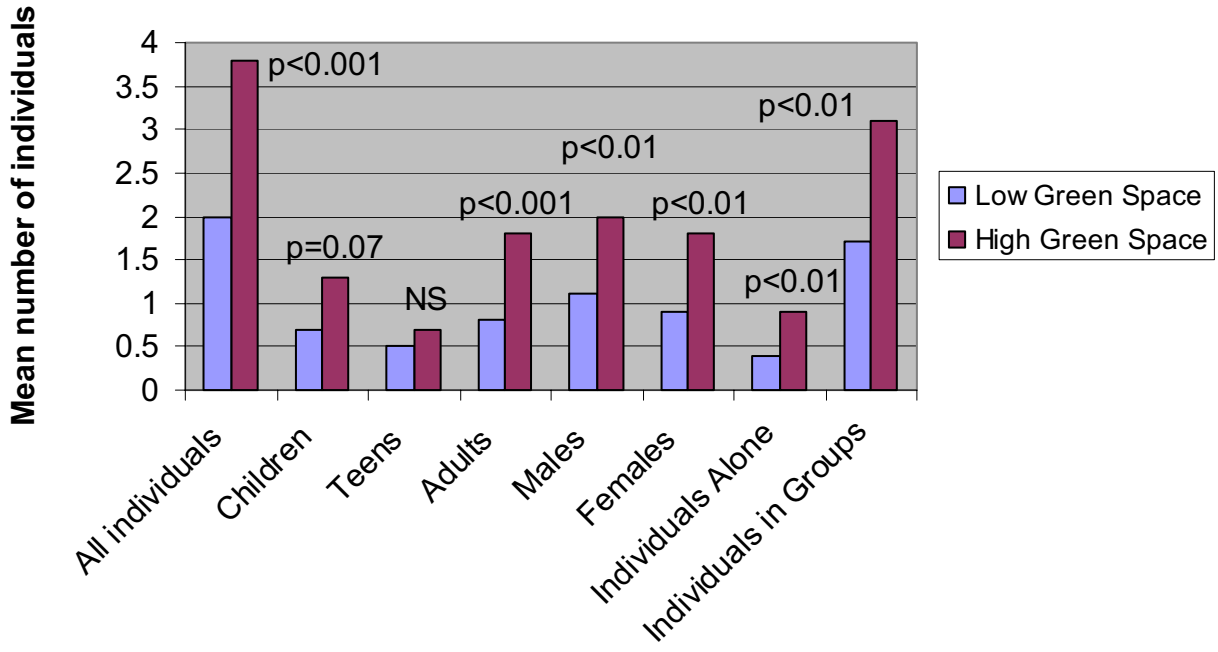


Figure 30. Analysis of variance comparing mean number of individuals and groups in spaces in low and high green-cover conditions.



A sense of community is even more important for the elderly. Elderly individuals with strong social connections have reduced risk of mortality[181] [182], reduced suicide rates[183], less fear of crime[184], better physical health[185] and a significantly higher sense of wellbeing[186].

Community ties are important for older people with associated greater life satisfaction and the ability to share emotional connections. Losing these ties has significant consequences, including social isolation, depression, illness and early death[187]. In a review of the literature regarding older individuals and social integration, Berardo states that there is strong evidence that "*social relations and networks are life-enhancing and contribute to longevity*" [188].

One study showed a significant improvement in increased neighbourly activity of 6%, and a 7% increase in friends and neighbours, in the elderly who had trees and grass compared to those surrounded by a barren landscape. Although this is more modest than the effects on younger adults, the advantages of strengthened ties are even more relevant[189].

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[181] Engedal K (1996) Mortality in the Elderly: A 3 year follow upof an elderly Community Sample. International Journal of Geriatric Psychiatry, 11(5), 467-471.
[182] Sabin EP (1993) Social Relationships and mortality among the elderly. J Applied Gerontology, 12(1), 44-60.
[183] Lester D and Moksony F (1994) The social correlates of Suicide in Hungary in the elderly. European Psychiatry, 9(6), 273-274.
[184] Eve RA and Eve SB (1984) The effects of powerlessness, fear of social change, and social integration on fear of crime among elderly. Victimology, 9(2), 290-295.
[185] Hughes EM (1994) The impact of social support networks on compliance with hypertensive therapeutic regimes. Dissertation Abstracts International, 54(8), 410B.
[186] Allard J, Allaire D, Leclere G and Langlois S (1995) The influence of family and social relationships on the consumption of Psychotropic drugs by the elderly. Archives of Gerontology and Geriatrics, 20(2), 193-204.
[187] Llewellyn LG (1981) The social cost of urban transportation. Human Behaviour and Environment: Advances in theory and research, 5,169-202.
[188] Berardo FM (1985) Social networks and life preservation. Death Studies, 9(1), 37-50.
[189] Kweon B-S, Sullivan W and Wiley A. (1998) Green Common Spaces and the Social Integration of Inner-City Older Adults. Environment and Behavior. 30(6) 832-858.

IN SUMMARY

"Social Relations and networks are life-enhancing and contribute to longevity". The natural environment contributes to social cohesion by providing inclusive places to meet. Some cases show a 90% increase whereas some studies show a non-significant rise. However, for the elderly, any improvement in social cohesion would be very significant.

Sense of Place

Public health has for years looked at the environment for its dangers such as air and water pollution, and accidents from traffic and drowning. That is like looking at all the side effects of a drug without understanding its efficacy. In a review of sense of place, Frumpkin looked at the evidence as a public health consultant. "Place" was taken as a series of attributes that could improve health. He states that all contact with nature needs further evaluation before it can be recommended to the healthcare industry. However, he agrees that good evidence supporting the health benefits for green space is available[190].

There are indications that neighbourhoods influence deaths from heart disease even after adjustments for risk factors[191]. Professor Sally Macintyre in a review on the place effects on health[192] argues how place has a contribution to health over and above the sum of individual risk factors. She gives an example in which children in a deprived area may not play in the open air, because:

- their families do not have gardens or the resources to take them to play in Parks,
- because there are too few parks,
- within the local culture play is thought not to be important,

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[190] Frumkin H (2003) Healthy Places: Exploring the Evidence. American Journal of Public Health. 93(9) p1451-1456.
[191] Diez Roux A, Borrell L, Haan M, Jackson S and Schultz R (2004) Neighbourhood environments and mortality in an elderly cohort: results from the cardiovascular health study. J Epidemiol Community Health 2004;58:917-923.
[192] Macintyre S, Ellaway A and Cummins S (2002) Place effects on health: how can we conceptualise, operationalise and measure them? Social Sciences and Medicine 55 (2002) 125-139.

- play is thought to be dangerous or not desirable to play with strangers (so even when provided with parks children might still not play in the fresh air).

In the same article Macintyre looks at the constituents of a healthy neighbourhood. These are 1) physical features shared by all that include drinking water, air quality and climate; 2) Availability of healthy environments at home, work and play (areas vary in their provision of green space, safe places for children to play and employment); 3) the services provided; 4) the culture of the community including levels of crime; and 5) the reputation of the area that leads to investment.

The mental health of individuals is also affected by the area that people live in, the effect being more than would be expected from the individuals themselves. A study in Hampshire found that deprived neighbourhood had significant higher levels of depression and that the depression persisted longer in patients living in these areas for longer than would be expected[193].

These studies suggest that health investment must be more than just investing in individuals and public health must work with many disciplines to create a healthy place. Chavis and Pretty[194] suggest the importance of the inclusion of the physical environment in understanding the relationship between sense of place and social capital. A study in Australia[195] confirmed the importance that people put on a healthy natural environment when moving house and how it contributed to their sense of purpose and sense of self. Attachment to place is both an individual and collective concept. It can be an expression of a community's beliefs and values, and of its emotional and belief-driven knowledge making.

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[193] Ostler K, Thompson C, Kinmonth LK, Peveler RC, Stevens L and Stevens A (2001). Influence od Socio-economic deprivation on the prevalence and outcome of depression in primary care. British J Psychiatry 178 12-17.
[194] Chavis DM and Pretty GMH (1999) Sense of community: Advances in measurement and application. J Community Psychology, 27,(6) 635-642.
[195] Bow V and Buys L (2002) Sense of Community and Place Attachment: the Natural Environment plays a vital role in developing a sense of community. Presented to the Social Change in 21st Century Conference.

Korpela and Hartig looked at the sense of place as psychologists and inferred that sense of place can be understood by the four parts of the Attention Restoration Theory in providing positive experience and restoration[196]: Being Away; Fascination; Coherence; Compatibility.

They interviewed 101 students to identify their favourite place and found that 48% described a place in the natural environment with the next category of residential settings scoring 19% and urban areas (street, city area etc) scored 16%. The most unpleasant places were the city areas (25%) followed by residential places (15%), healthcare settings (11%) and then school settings (10%). The natural environment scored only 5%. Using further questions, the favourite places scored highly for restoration with students describing their place as peaceful to allow quiet reflection and getting away from it all.

In a study in low rise accommodation, looking out of the window at home was a strong predictor of neighbourhood satisfaction and wellbeing. However, of particular preference is a natural environment that appears well cared for, and most importantly, contained trees[197].

A person's attachment to a place is therefore a result of past positive experiences with the natural environment. Places are public in that they belong to the community but can provide special areas for individuals to enjoy and be restored. Places are an expression of the values and beliefs of a community. They provide meaning and purpose. When people look after their place and its people they develop a feeling of belonging, which encourages a sense of identity[198].

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[196] Korpela K and Hartig T (1996) Restorative Qualities of Favourite Places. J Environ. Pyschology, 16, 221-223.
[197] Kaplan R (2001) The Nature of the View from Home: Psychological Benefits. Environment and Behaviour. 33; 4 July 2001.
[198] Bow V and Buys L (DATE??) Sense of Community and place attachment: the natural environment plays a vital role in developing a sense of community. Paper presented to the Social Change in the 21st Century Conference.

IN SUMMARY

Place is a difficult word describe. A sense of place describes an attachment to a place that is an important part of a person's sense of identity and creates a feeling of belonging. Place dependence describes the perceived strength of association between a person and a specific place. Place identity describes the integration of the person's "self" that develops in relation to the physical environment.

The natural environment has a strong influence on peoples' relationship with place, and is consistently their preferred location. The natural environment is therefore important in creating a sense of belonging and identity, which in turn improves mental health.